出國報告（出國類別：其他）

赴上海參加 2015 年材料工藝技術國際研討會(MPT2015)出國報告

服務機關： 核能研究所
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派赴國家： 大陸上海市
出國期間：104 年 7 月 19 日~104 年 7 月 22 日
報告日期：104 年 8 月 6 日

摘　要

　　「2015 年材料工藝技術國際研討會」(International Conference on Material Processing Technology, MPT 2015)將於 2015 年 7 月 19 日至 21 日於大陸上海市舉辦。本屆會議探討主題包含各項材料工藝技術，議題分為材料塗佈與材料加工技術(Materials Casting/Forming/Machining)、表面工程(Surface Engineering)、功能性材料加工技術(Processing Technology for Functional Materials)、低成本封裝(Low Cost Packaging)、 綠色製程(Green Manufacturing and Processing)等領域。議題範圍廣泛並與能源元件製程之關鍵技術有所重疊。本會議之內容以演講為主，少數以海報呈現，在會議舉辦的過程中，共計有 88 場學者演講，數篇海報供與會者閱讀討論。發表研究成果演說的學者來自世界各地，本研討會之目的為促進學術與產業聯結互動，藉由參與研討會的科學家及工程師共同努力。

　　本所於電漿環保能源技術、電漿鍍製薄膜元件製備技術之研發卓有成效，本次參加研討會並發表之論文主要成果在電漿鍍製薄膜元件於電致變色元件應用，除能彰顯本所於電漿環保能源技術、電漿鍍製薄膜元件製備技術領域的研發成效外，並期望藉由會議發表論文、專題討論過程中瞭解大陸與國際間相關的研發現況，尋求可能引入之最新技術，或可能開發之應用市場及合作機會，強化合作關係並增益本所現有之研發技術，以利於本所相關計畫工作未來的加速推動。在本次會議的過程中，了解奈米銀導線陣列技術於薄膜電晶體的應用原理以及製備程序，而此概念可以引入本所於電致變色元件開發，在不影響元件整體穿透度的前提，達到降低元件電阻的效果，改善目前於大面積電致變色元件開發的問題；本次會議的演說內容多包含了奈米科技的應用，例如奈米尺度、奈米結構或特殊功能性等，未來在開發薄膜材料時，可參考這些研究成果，設計出更具競爭力的薄膜材料，結合現有的技術，進而發展出本所的新型獨佔技術；在會議中與其他研究團隊相比較，本所於電漿技術領域已具備良好基礎，也具有設備與技術上的優勢，然而大部分的研究皆非以單一研究領域為主，多為整合型的研究議題，諸如生物感測、化學催化、產能儲能元件等，未來本所的電漿技術可向跨領域進行多方嘗試，進行整合與應用。

目　　次

圖目錄

一、目 的

　　「2015 年材料工藝技術國際研討會」(International Conference on Material Processing Technology, MPT 2015)將於 2015 年 7 月 19 日至 21 日於大陸上海市舉辦。本屆會議探討主題包含各項材料工藝技術，議題分為材料塗佈與材料加工技術(Materials Casting/Forming/Machining)、表面工程(Surface Engineering)、功能性材料加工技術(Processing Technology for Functional Materials)、低成本封裝(Low Cost Packaging)、綠色製程(Green Manufacturing and Processing)等領域。議題範圍廣泛並與能源元件製程之關鍵技術有所重疊。本研討會之目的為促進學術與產業聯結互動，藉由參與研討會的科學家及工程師共同努力。

　　本所於電漿環保能源技術、電漿鍍製薄膜元件製備技術之研發卓有成效，派員參加研討會並發表論文除能彰顯本所於電漿環保能源技術、電漿鍍製薄膜元件製備技術領域的之研發成效外，並能藉由會議專題討論瞭解大陸與國際間的研發現況，尋求可能之應用市場及合作機會，強化合作關係及增益本所研發技術，以利於本所相關計畫工作之加速推動。

二、過 程

本次公差之行程如下：

7 月 19 日　　08:00 自台北松山國際機場出發，於當地時間 10:00 抵達大陸上海浦東國際機場。從機場搭乘地下鐵前往會議舉行地點粵海飯店(Guangdong Hotel)，於 12:00 到達會議場地，並且在 15:30 辦理完會議報到與註冊程序。

7 月 20 日　　參加 2015 年材料工藝技術國際研討會及蒐集資研發資料。

7 月 21 日　　參加 2015 年材料工藝技術國際研討會及蒐集資研發資料，並於 10:30 口頭發表本組研究成果以及會議論文。

7 月 22 日　　於當地時間 09:30 自粵海飯店出發，搭乘地下鐵前往上海浦東國際機場。11:30 抵達上海浦東國際機場，並於 13:10 自上海浦東國際機場出發前往桃園國際機場，班機因故延遲了 30 分鐘，返回台灣時間為 15:30，順利完成本次公差任務。

三、心 得

　　本會議之內容以演講為主，少數以海報呈現。會議現場分為三個會議廳，分別以地質與能源(Geology and Energy)、材料科學(Materials Science)以及數學分析(Mathematics)為討論主題，在同一時間進行演說發表。會議時程如圖 1 所示，每日會議從上午八點 30 分開始至下午六點結束。與會人員包含來自世界各地的專家學者，其中又以中國大陸佔較多數。根據會議議程表，經過初步統計後發現，口頭演講總計共有 88 場，演說學者來自亞洲的有 51 場；歐洲有 20 場；美洲有 14 場；大洋洲為 2 場；非洲為 1 場。由此可知來自亞洲的研究發表佔本會議的大多數，而再細分後，台灣的成果發表共有 7 場，雖然相較於主辦單位中國大陸的 25 場為少，已是亞洲部分的第二多數，不難窺見台灣學術研究在國際上所具備的競爭力。圖 2 為會議註

冊會場以及演講會場實際照片，由於作者全程參與材料科學相關議題，因此心得部分僅於材料科學部分的演講內容進行說明與介紹。

圖 1. MPT2015 研討會會議時程

圖 2. MPT2015 研討會會議註冊會場以及演講會場

　　相關的會議資料數據或照片如下，圖 3 為德國 Fraunhofer 陶瓷技術和系統研究中心(The Fraunhofer Institute for Ceramic Technologies and Systems IKTS)的 Jens Klimke 博士所發表的研究成果，為一種新型的功能性透明陶瓷複合材料，藉由在多晶矽(polycrystalline)中摻雜不同比例的透明陶瓷氧化物，例如 Al_2O_3，$MgAl_2O_2$ 或 ZrO_2 等，經由簡單的粉末研磨混合、塗佈(gel casting)、燒結(sintering)、熱壓(hot-pressing)後可以得到具備不同光學特性的材料，如圖 4 所示，可製備出粉紅色、綠色以及藍色等透明陶瓷複合材料，並呈現出如紅寶石與藍寶石般的光澤。報告內容也比較了與傳統陶瓷材料製程的差異點。
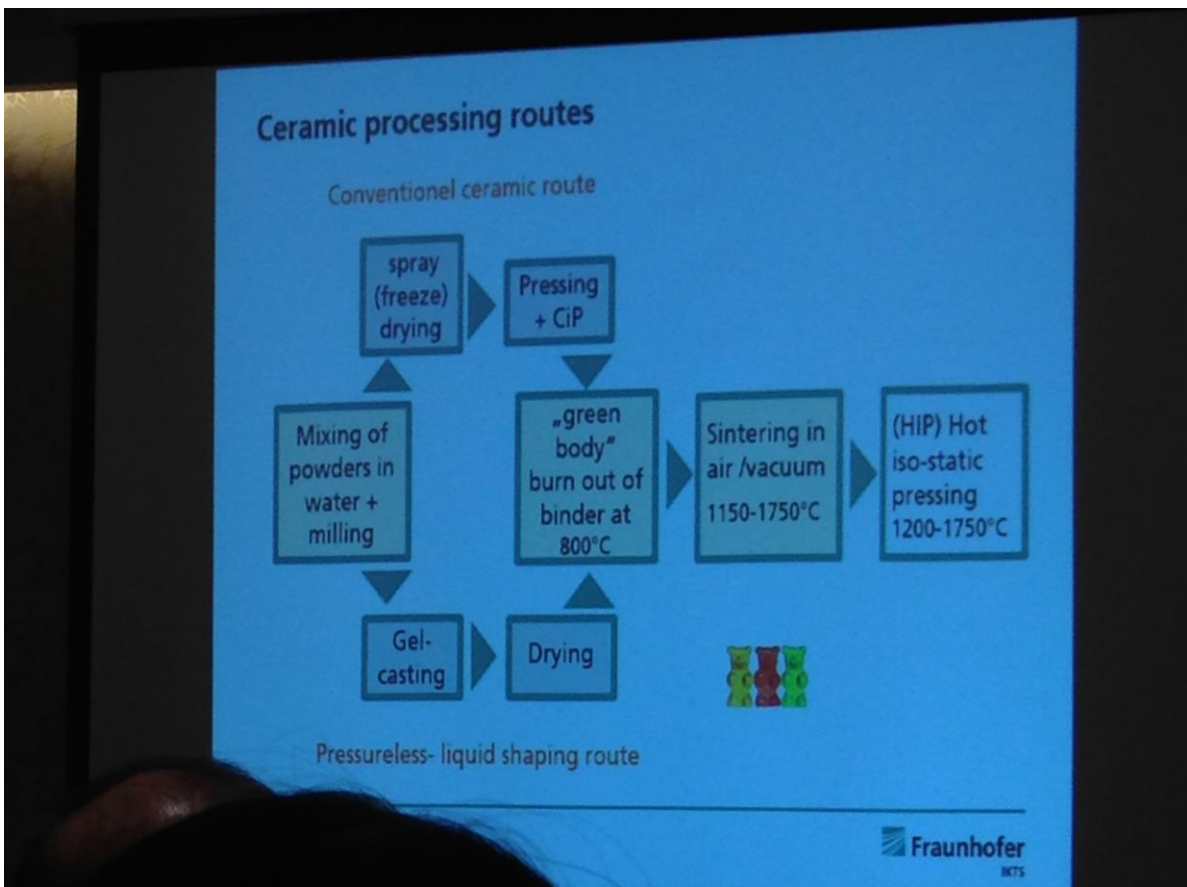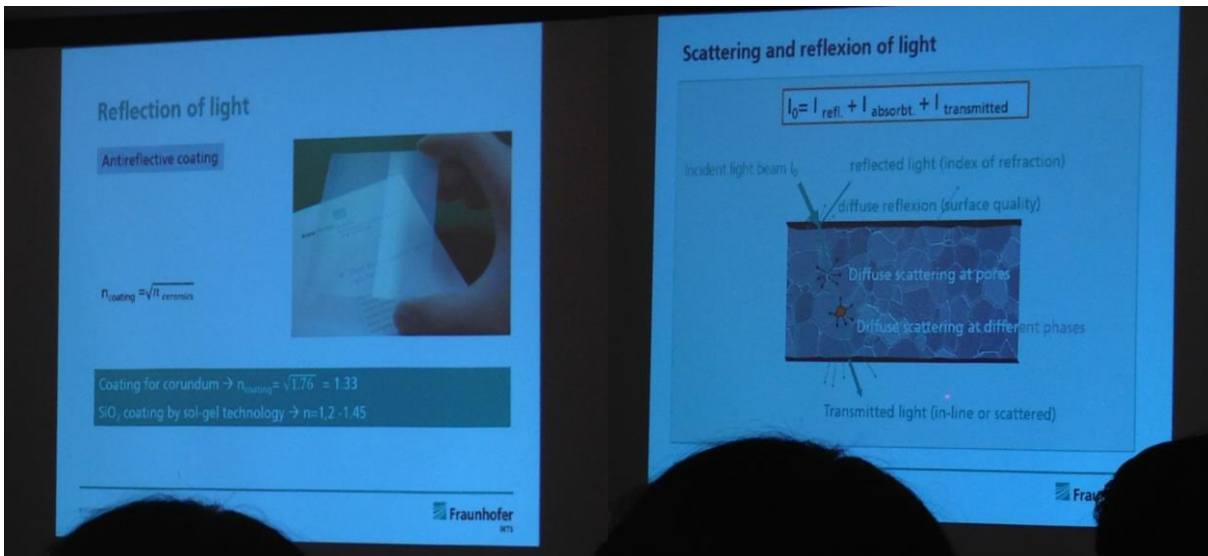
圖 3. 新型的功能性透明陶瓷複合材料之成品展示、工作原理以及製備程序
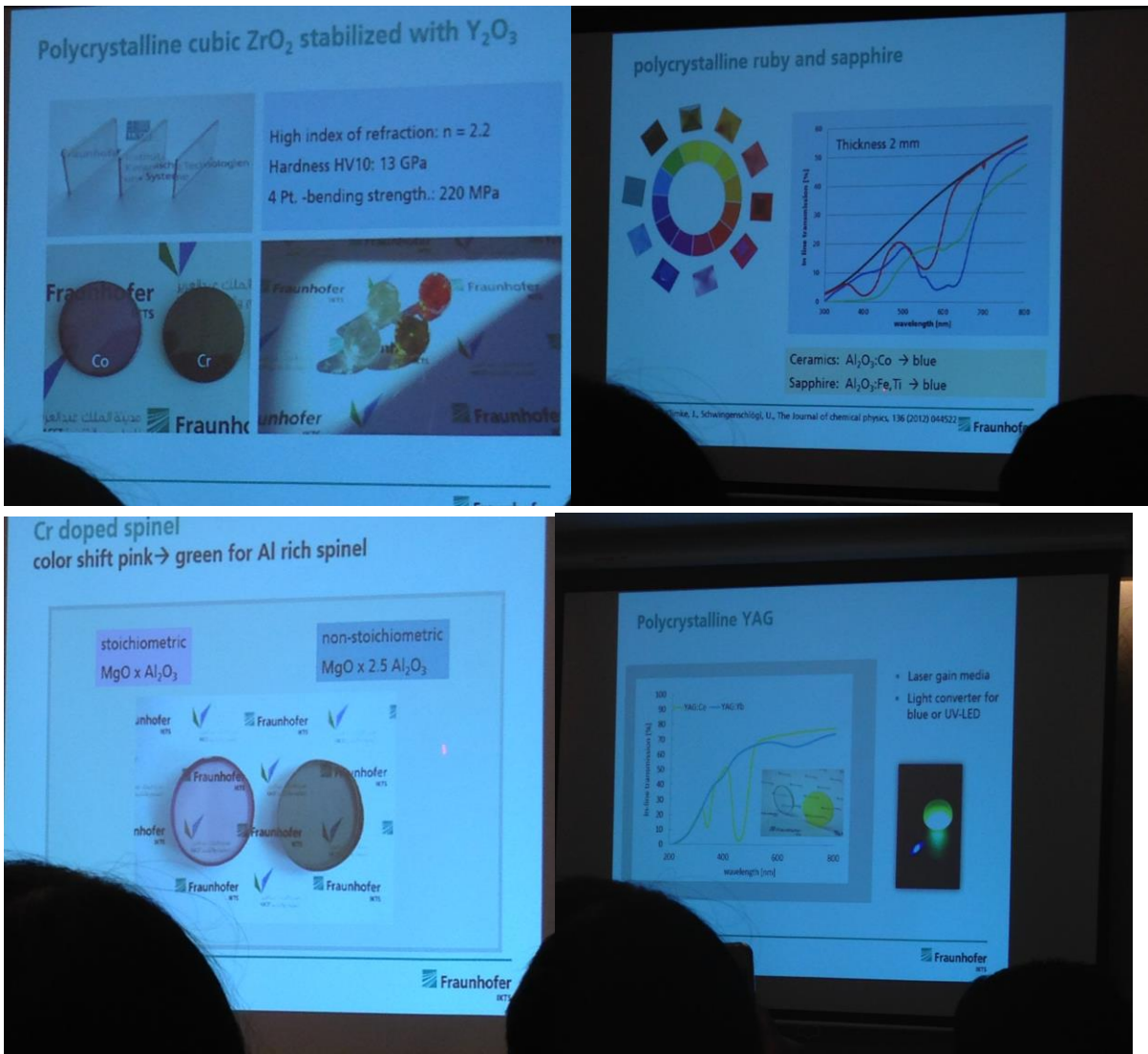
圖 4. 新型功能性陶瓷複合材料具備的光學特性測量與實際展示

圖 5 為來自捷克的布拉格化學與科技大學(University of Chemistry and Technology, Prague)的研究成果，主題為製作多孔性的莫來石(Mullite)以及莫來石-礬土陶瓷材料(Mullite-Alumina Ceramics)。多孔性材料可以透過成孔劑加入，經過傳統的粉末處理途徑取得來獲得，是一種簡易的程序。如圖 6 所示，澱粉是一種天然的成孔劑，可以經由玉米、馬鈴薯、小麥等來源取得，根據不同來源的澱粉成孔劑，所獲得的孔洞大小也有所不同，範圍介於 1-50 μm 間。為了使材料有機會應用於高溫催化劑載體、輻射燃燒器以及熱氣體過濾器等，此多孔性材料必須具備低熱膨脹係數以及良好的熱衝擊性。在此團隊的研究成果中可以了解，此材料除了具備高孔洞性，同時也具有一定的彈性，可以承受小部分的拉伸形變，以對應其他可能的產業應用。
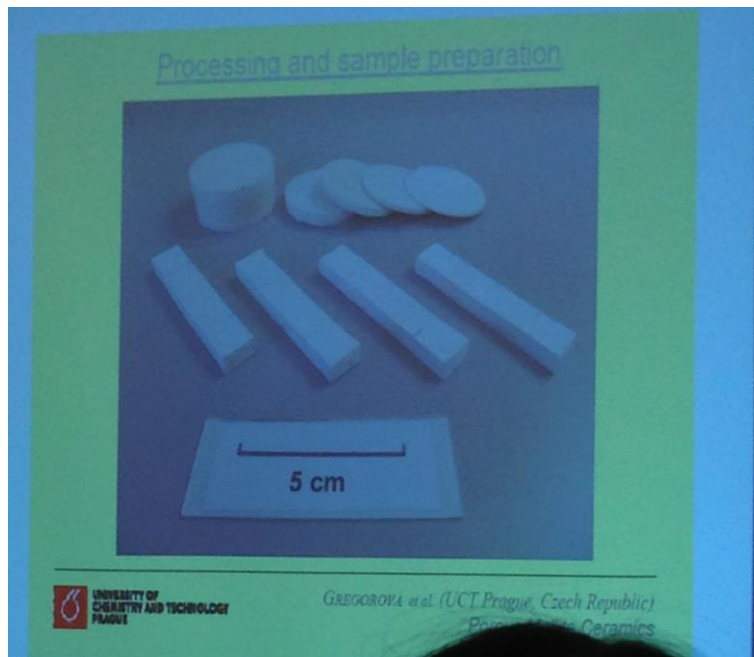
圖 5. 多孔性莫來石塊材成品展示
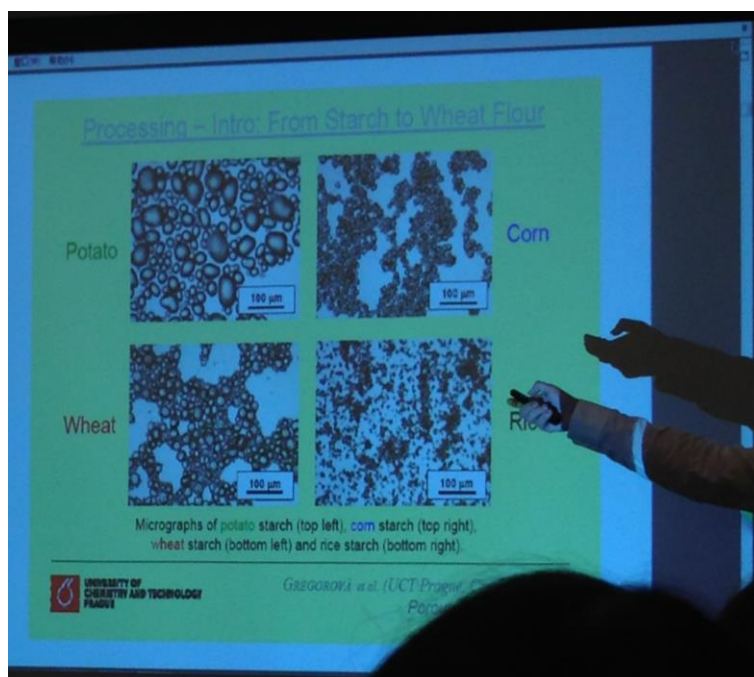
圖 6. 不同來源的澱粉成孔劑以及其成孔尺寸分布

圖 7 為臺灣交通大學光電系冉曉雯教授所發表的相關研究，主題是利用奈米銀導線陣列對非晶 InGaZnO 薄膜電晶體進行改進。其概念為在電極基材上以旋轉塗佈的方式，製備一層具方向性的奈米銀導線，接著再以濺鍍方式沉積 InGaZnO 薄膜，進而分析不同製備條件下的薄膜電晶體特性，詳細的薄膜電晶體製程如圖 8 所示。由圖 9 的實驗結果，除了觀察到加入奈米銀導線後，薄膜電晶體的有效場效應遷移率(effective field-effect mobility)有提升之外，在奈米銀導線排列方向與電流呈順向的條件下，薄膜電晶體的效率可以獲得最佳的改善。如何控制奈米銀導線的排列即為此研究的關鍵，主要是利用改變旋轉塗佈時的轉速來達成。
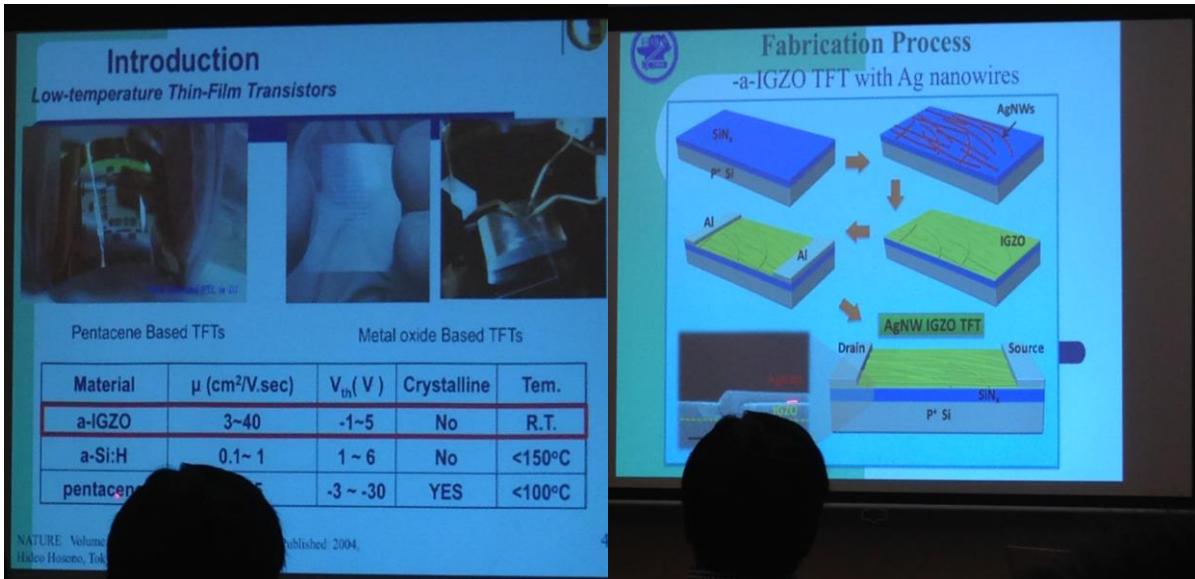
圖 7. 利用奈米銀導線陣列對非晶 InGaZnO 薄膜電晶體進行改良
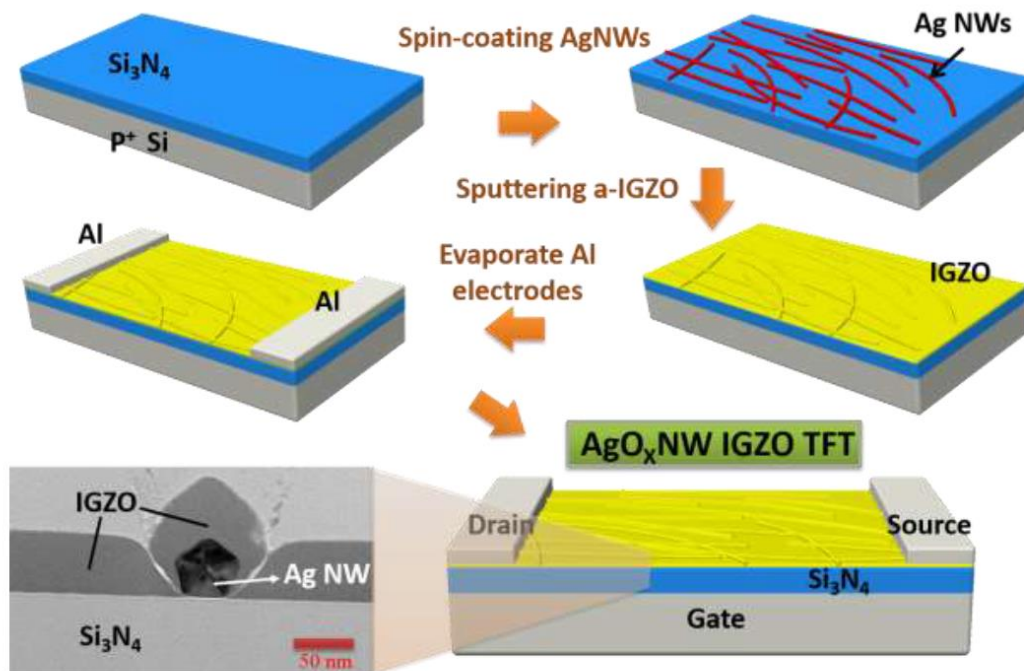
圖 8. 搭配奈米銀導線陣列之非晶 InGaZnO 薄膜電晶體的製作程序
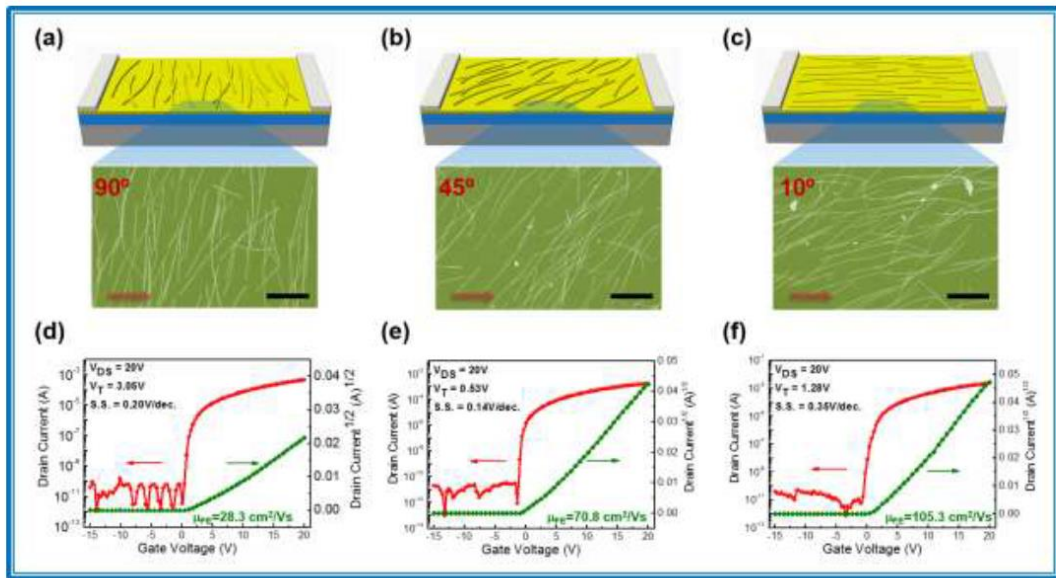
圖 9. 不同奈米銀導線排列對於非晶 InGaZnO 薄膜電晶體效率之影響

  圖 10 為中國大陸西安交通大學孫教授所發表的研究成果，主題是製備具奈米孔洞之氧化銅/二氧化鈰複合材料並應用於一氧化碳的催化反應。此研究是先將鋁、銅、鈰等金屬以電弧熔煉(arc-melting)方式，在無氧環境下製成合金。再將此合金錠在高溫下製成 melt-spun ribbons，並以滾筒收集之，melt-spun ribbons 的厚度約為 30 μm，寬度約為 3 mm。由圖 10 的 TEM 數據可以觀察到此複合材料所形成的奈米孔洞結構。二氧化鈰形成於氧化銅表面，產生了許多介面，提升孔隙度與表面積，二氧化鈰與氧化銅的 grain size 約為 5 nm。圖 11 為一氧化碳氧化反應測試，可以觀察到加入二氧化鈰的複合材料明顯降低了反應溫度，表現出更佳的催化效果。
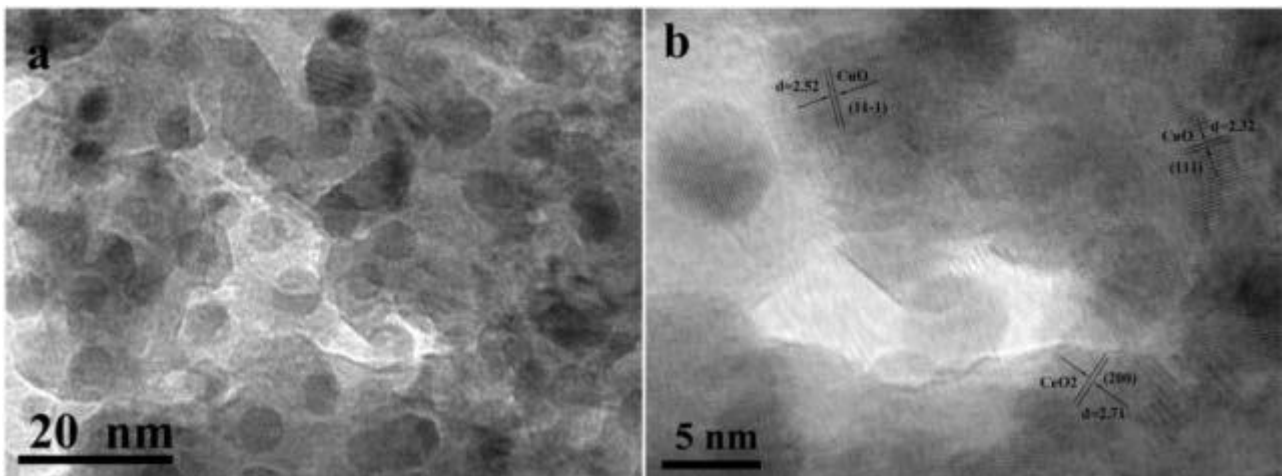
圖 10. 具奈米孔洞之氧化銅/二氧化鈰複合材料之穿透式電子顯微鏡觀測結果
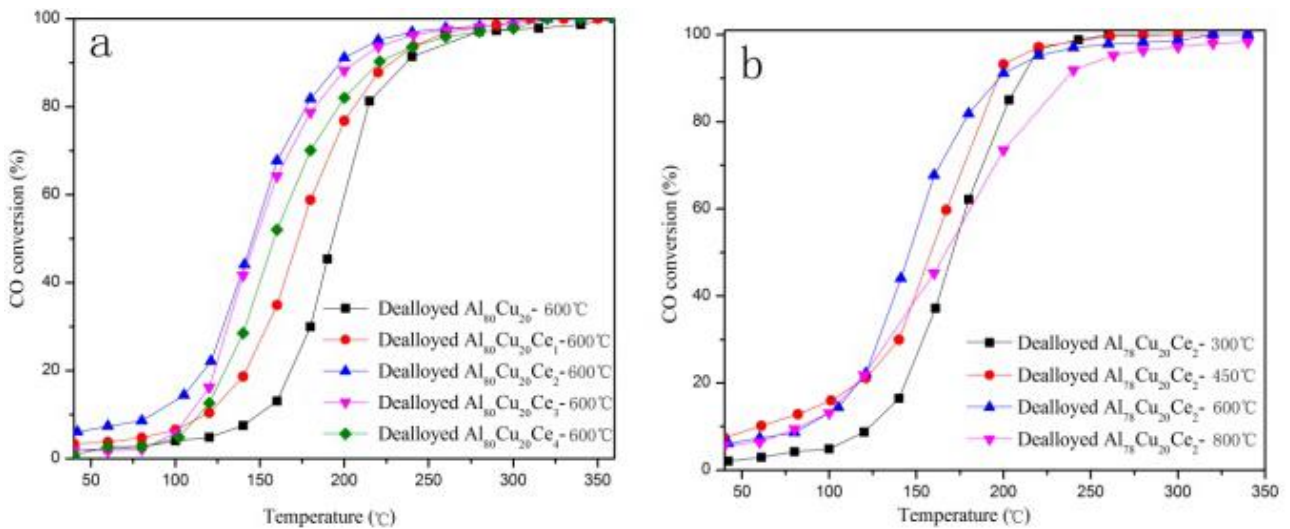
圖 11. 氧化銅/二氧化鈰奈米複合材料對一氧化碳氧化反應之催化測試

圖 12 為義大利國家研究委員會 Eugenio Amendola 博士的研究成果，該團隊開發出一種具備自我修復功能(self-healing)的新形態高分子材料。傳統的自我修復高分子材料的概念，是將修復劑(healing agent)藏於材料中，利用膠囊結構獨立保存，當材料受損時，同時釋放出修復劑並且開始與材料進行化學反應，達成修復的目的。而此研究有別於傳統的概念，利用高分子合成技術，將修復劑與高分子材料主鏈以化學鍵結合，而此化學鍵結對於熱有敏感性，高溫時會自動斷鍵，將修復劑釋出，因此當材料受損時，僅需加熱即可達成修復的目的。實驗結果如圖 13 所示。
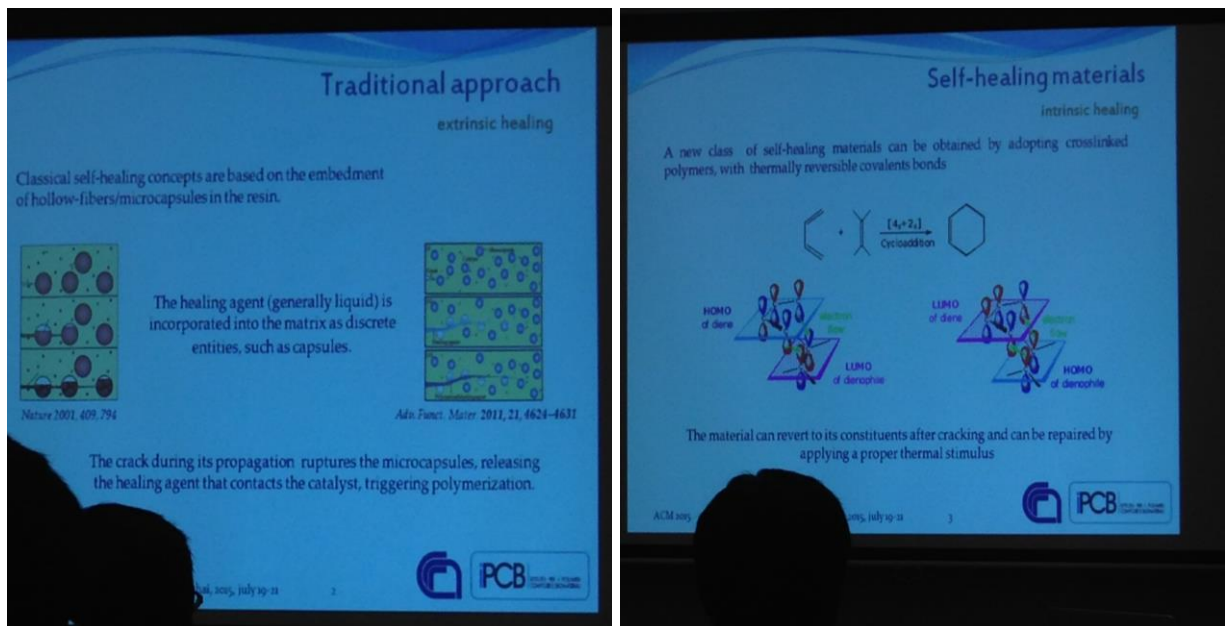
圖 12. 具自我修復功能之高分子材料之修復機制與設計概念
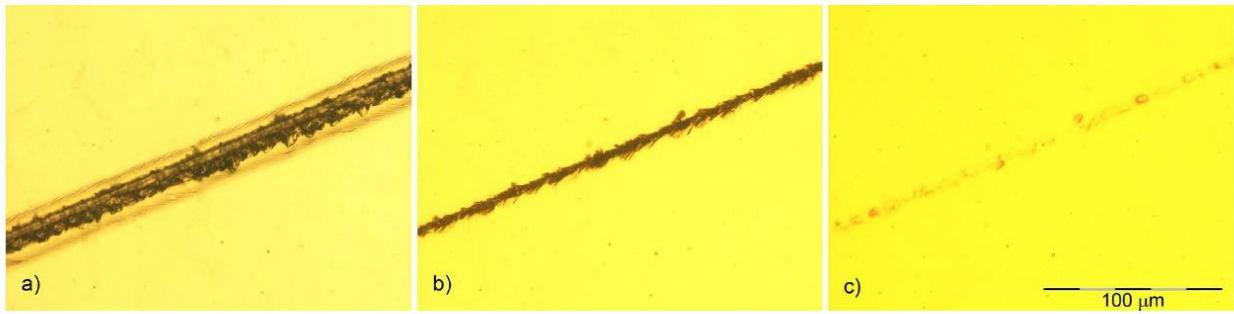
Figure 3. Optical images of 2Ph2Epo-DGEBA (65:35) + DDM-Jeff500 (60:40). (a) Scratched sample; (b) Partially healed at 140˚C for 5 min; (c) healed at 140˚C for 25 min.

圖 13. 新型態自我修復高分子材料之修復過程紀錄

　　圖 14 為美國 Wijesiriwardana 教授所發表的可撓式熱輻射系統，將奈米複合材料的技術與紡織品製造工藝進行結合，使得熱輻射的效果更為均勻穩定。此研究中的熱輻射系統為兩層結構，其中一層為供電電極，利用針織機所編織出來，如圖 15 的編織進料所示，此層電極包含了導電的銀紗與絕緣的聚醯胺(polyamide)紗，因此可以編織成梳狀電極；另外一層結構為底端的加熱元件，以聚氨酯發泡材料(polyurethane foam)為主，而在此高分子發泡材料中填充了碳黑(carbon black)以及奈米碳管(carbon nanotube)的複合材料，並且將此層製作成波浪狀的結構。作者以數值模擬方法預估此熱輻射器的溫度分布及變化趨勢，並且在實際操作時測量數據，最後比對理論模擬與實驗數據的結果，相關的實驗數據如圖 16 以及圖 17 所示。在結論中提到，無論是從溫度反應速度或是均勻度的結果來比較，以奈米碳管填充之熱輻射裝置可以獲得較佳的表現。
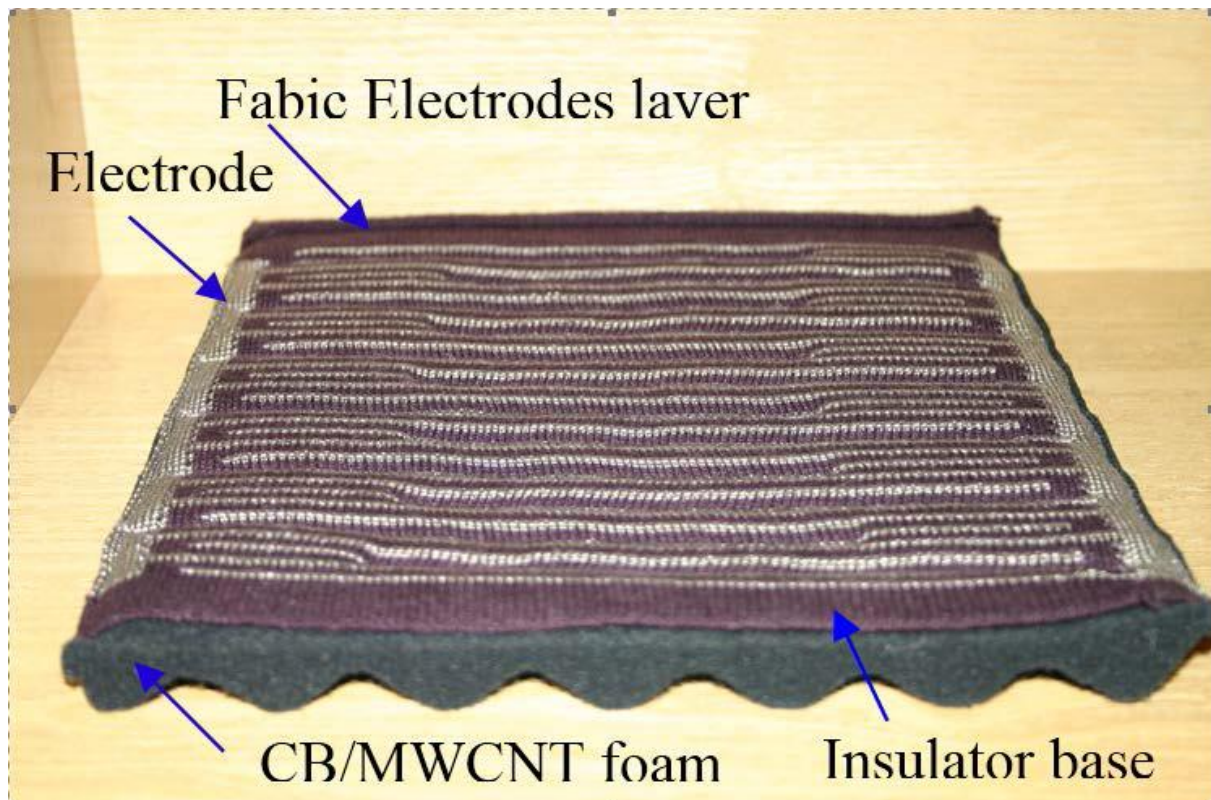
圖 14. 以碳黑/奈米碳管/聚氨酯構成之可撓式熱輻射裝置

圖 15. 以針織機製作梳狀電極之進料示意圖
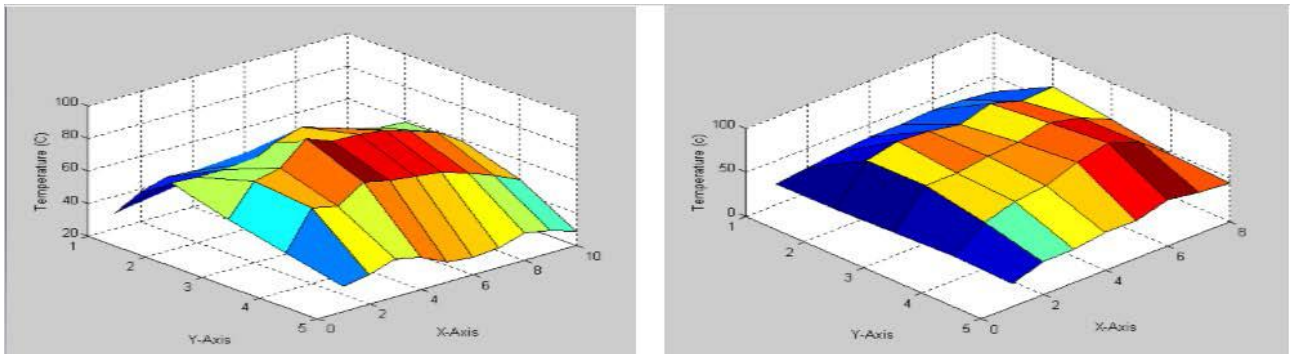
圖 16.以奈米碳管(左圖)及碳黑(右圖)所填充之熱輻射裝置實際操作時的溫度分布圖
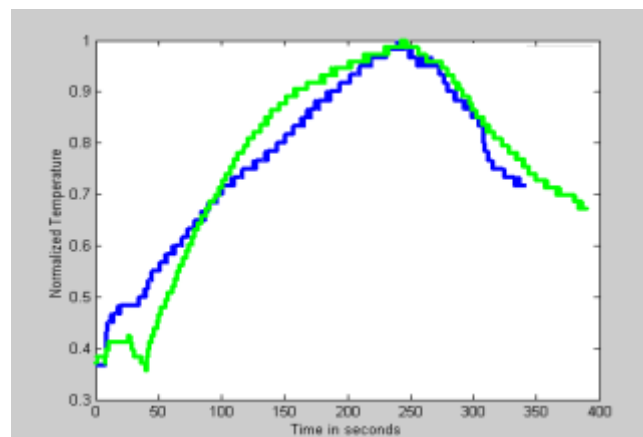
圖 17.以奈米碳管(藍線)及碳黑(綠線)所填充之熱輻射裝置之溫度變化圖

四、建 議 事 項

(一) 利用奈米銀導線陣列的概念可以引入本所於電致變色元件開發，在不影響元件整體穿透度的前提，達到降低元件電阻的效果，改善目前於大面積電致變色元件開發的問題。

(二) 未來在開發薄膜材料時，可以強調具備奈米尺度、奈米結構或特殊功能性，設計出更具競爭力的薄膜材料，結合現有的技術，進而發展出本所的新型獨佔技術。

(三) 本所於電漿技術領域已具備良好基礎，也具有設備與技術上的優勢，建議未來向跨領域進行多方嘗試，諸如生物感測、化學催化、產能儲能等方面進行整合與應用。

五、附　錄

附錄一、會議議程與摘要全集
附錄二、本次會議所口頭發表之論文投影片

Table of Contents

Part I   Conference Schedule

Time: July 19-July 21, 2015

Location: Guangdong Hotel (Shanghai), Shanghai, China

Date	Time	Lobby			
July 19	**14:00-17:00**	**Registration**			
Date	**Time**	**Lotus Room (荷花厅)**		**Magnolia Room (白玉兰厅)**	**Kapok Room (木棉厅)**
July 20	**08:30-12:00**	Invited Session 1: Geology and Energy Prof. Chong-Yu Xu, Dr. Shu-Qing Yang, Prof. Junye Wang, Prof. Shakeel Ahmed, Prof. Albert S. Kim **Chair:** Prof. Albert S. Kim **Coffee Break: 10:30-10:40**		Invited Session 2: Materials Sciences Prof. Hans-Joachim Kleebe, Dr. Jens Klimke, Prof. Junhui Hu, Prof. Sergei Alexandrov, Dr. Eva Gregorova **Chair:** Prof. Laner Wu **Coffee Break: 10:30-10:40**	Invited Session 3: Mathematics Dr. Adam Ding, Prof. Akif Ibragimov, Prof. Zvi Arad, Prof. Stanislaw Migorski, Prof. Wenjiang Fu, **Chair:** Prof. Wanyang Dai **Coffee Break: 10:30-10:40**
	12:00-13:30	**Lunch** [328 Western Restaurant (328 西餐厅), 1st Floor]			
Date	**Time**	**Lotus Room (荷花厅)**	**Sakura Room (樱花厅)**	**Magnolia Room (白玉兰厅)**	**Kapok Room (木棉厅)**
July 20	**14:00-18:00**	Technical Session 1: Geology and Energy I **Chair:** Dr. Shu-Qing Yang **Coffee Break: 15:30-15:45**	Technical Session 2: Geology and Energy II **Chair:** Prof. Junye Wang **Coffee Break: 15:45-16:00**	Invited Session 4 & Technical Session 3: Material Sciences I Dr. Willi Pabst, Dr. Tomohiro Okumura, Dr. Mohammad Jawaid, Prof. David Bassir **Chair:** Dr. Mohammad Jawaid **Coffee Break: 15:20-15:35**	Invited Session 5 & Technical Session 4: Mathematics I Prof. Manuel Molina, Prof. Pawel Hitczenko, Prof. Wanyang Dai **Chair:** Prof. Manuel Molina **Coffee Break: 15:30-15:45**
	18:00-19:30	**Dinner** [328 Western Restaurant (328 西餐厅), 1st Floor]			
Date	**Time**	**Sakura Room (樱花厅)**	**Magnolia Room (白玉兰厅)**	**Lotus Room (荷花厅)**	**Redbud Room (紫荆厅)**
July 21	**08:30-12:00**	Technical Session 5: Material Sciences II Prof. Xin Yao **Chair:** Prof. Zhong Hu **Coffee Break: 10:10-10:25**	Technical Session 6: Material Sciences III **Chair:** Prof. Nikolai Bokov **Coffee Break: 10:00-10:15**	Technical Session 7: Mathematics II **Chair:** Prof. Marco Fontana **Coffee Break: 10:15-10:30**	Technical Session 8: Mathematics III **Chair:** Prof. Stanislaw Migorski **Coffee Break: 10:15-10:30**
	12:00-13:30	**Lunch** [328 Western Restaurant (328 西餐厅), 1st Floor]			
July 22	**08:00-18:00**	**One-day Tour**			

Part II Invited Speeches

Invited Session 1: Geology and Energy

Invited Speech 1: Hydrological Modeling in Climate Change Studies: Issues and Challenges

Speaker: Prof. Chong-Yu Xu, University of Oslo, Sweden
Time: 08:30-09:10, Monday Morning, July 20, 2015
Location: Invited Session 1: Geology and Energy, Lotus Room(荷花厅), 4th
Floor Guangdong Hotel (Shanghai)

Abstract
This presentation discusses the impact of environment change on hydrological cycle, hydrological processes and hydrological modeling. The talk starts with a review of the history of the hydrological models' development, the current state and the main challenges. Emphases are then paid to the following issues: the non-stationarity of hydrological processes and the rainfall-runoff relationship, the transferability of hydro- logical models (structure and parameters) across time periods, across spatial regions, across spatial and time scales, and coupling of hydrological models with climate models.

Invited Speech 2: How to Supply Sufficient Good Quality Water to Coastal Communities by Coastal Reservoirs

Speaker: Dr. Shu-Qing Yang, University of Wollongong, Australia
Time: 09:10-09:50, Monday Morning, July 20, 2015
Location: Invited Session 1: Geology and Energy, Lotus Room(荷花厅), 4th
Floor Guangdong Hotel (Shanghai)

Abstract
Water is the essence of life and through water we experience the impact of climate change directly. The United Nations predict that 2/3 rds of the world's population will be under water stress conditions by 2025. The US National Academy of Engineering (NAE) lists clean water supply as one of 21st century's Grand Challenges that must be addressed and solved for quality of life to be sustainable in the future. Apart from the natural scarcity of freshwater, the quality of the available freshwater is also deteriorating due to pollution, hence intensifying the shortage. Every day, 2 million tons of sewage and other effluents drain into the world's waterways,

six times more water than what exists in all the rivers of the world. Global water resources are grossly polluted by wastes to the point that vast stretches of rivers are dead/dying and many lakes are cesspools of waste. Aiming to this, many proposals have been proposed and practiced in the world like desalination plants, wastewater reuse facilities etc. However after review the limitations of these methods, we conclude that coastal reservoirs will dominate future's water supply because: 1) We presently only use about 15 % of the available water resources worldwide, the remaining 85 % of water is lost to the sea and most of it is floodwater. As the climate warms, some types of extreme weather could become more frequent and severe, with increases in extreme heat, intense precipitation, and long-term drought. Heavy rains and flooding may become more frequent. Change in weather patterns and runoff will require very large storage capacity that only the sea can provide. 2) As more people migrate to the coastal areas for permanent settlement, the existing water supply infrastructures cannot match the future distribution of the population. As a result of these inhabitant changes, the coastal areas will bear the highest water stress. Many Asian countries/cities have experienced this change. For example, in China almost all coastal cities suffer severe water shortage. 3) Unlike conventional inland dams, coastal reservoirs collect runoff in a seawall contained area in the sea. Positioned at the end of a river mouth, it has the potential to capture all runoff from a watershed. Coastal reservoirs provide the greatest potential for runoff collection. This innovative water solution has avoided the environmental impacts experienced by inland dams, such as the negative effects of the reservoir's downstream effluent, land inundation, and population displacement etc. Coastal reservoirs construction costs are much less than conventional damming and there are no energy costs and carbon emissions for desalination or treatment processes that desalination plants and wastewater treatment plants have. It is suggested that only the best quality floodwater is pre-treated by agricultural wetlands prior to its storage in the coastal reservoir, thus high quality water supply is ensured. The potential application of wetland + coastal reservoir to Shanghai's water supply will be discussed, and the preliminary results show that Shanghai people can drink water as good as the spring bottled water.

Invited Speech 3: A Unified Approach for Process-Based Modelling of

Remediation and Reclamation

Speaker: Prof. Junye Wang, Athabasca University, Canada
Time: 09:50-10:30, Monday Morning, July 20, 2015
Location: Invited Session 1: Geology and Energy, Lotus Room(荷花厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract
Unconventional oil and gas, such as oilsands and shale gas, has tremendous economic potential in the world. However, concerns over the extraction and reclamation and management of this resource are causing because of the potential dangers such as water contamination, toxic and known carcinogens from flow-back. Land use changes due to oilsand mining are strong determinants of soil degradation, absorption and diffusion of tailing pollutants.

However, the whole life cycle of tailing and wastewater is poorly understood because of complex natural abiotic processes such as soil absorption and filtration of chemicals, and biotic recycling via root systems and soil microorganisms. Indirect effects from oilsand tailing could be detrimental, but there is a scarcity of data to verify current claims. There are also major knowledge gaps in how the tailing pollutants will degrade and diffuse through the biogeochemical processes above and below ground once they are inputted to a site or a watershed. Hydrological models are the dominant tools for assessment of environmental impacts of chemicals on a site or watershed. However, hydrological models cannot capture the natural abiotic and biotic processes of pollutants due to lack of abiotic and biotic functions and anthropogenic actions in agricultural and rural regions. This talk present the advent of agroecosystem modeling which has provided opportunities to develop a modeling framework of dynamic interactions among nutrients, water, oilsand pollutants, soil, and flora with or without oilsands in rural regions. We will introduce existing agroecosystem model: Denitrification Decomposition (DNDC) and discuss integrating possibility with site reclamation in terms of the needs of integrated modeling of oilsand and agroecosystem, which are essential to couple vegetation-land-water-atmosphere in order to study dynamic interactions among nutrients, pollutants, water, soil, flora and climate above and below ground.

The integrated modeling framework of oilsand site reclamation and agroecosystem will be used for deeper understanding of the environmental impacts of oilsands on agricultural and rural systems. This will provide a unique capability to evaluate biogeochemical degradation, absorption and diffusion of tailing pollutant with emphasis on dynamic interactions among pollutants, water, nutrient, soils, vegetation and climate. This framework will also help identify key factors, design and implement effective monitoring systems for the environmental impacts of oilsand pollution on rural regions, and propose practical measures for reclamation management of the cumulative effects of oilsand tailing.

Invited Speech 4: Heliborne Dual Moment Transient Electromagnetic

Investigation in Geologically Divergent Terrenes for Groundwater Mapping

Speaker: Prof. Shakeel Ahmed, Academy of Scientific and Innovative Research (AcSIR), India
Time: 10:40-11:20, Monday Morning, July 20, 2015
Location: Invited Session 1: Geology and Energy, Lotus Room(荷花厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract

India is now facing serious water challenges and issues due to global climate change, the green revolution, environmental and human influences which have exacerbated the pressure and compromised the sustainability of India`s water resources, particularly the groundwater. Although the country is beset with variable water problems simply as the distribution of water resources are highly uneven, the biggest issue is of the groundwater management. Comprehensive knowledge of aquifer system is an important requisite for its affective management. Given the fact

that geological formations where aquifers exist are highly variable and complex, punctual and scarce information are not enough to understand, asses and manage them. Thus continuous data acquisition and their interpretation as well as integration is the solution.

Heliborne Dual moment Transient Electromagnetic (HTEM) along with Magnetic measurement (HMAG) have been carried out in the divergent geological terrenes comprising of Gangetic alluvium, Tertiary sediments underlying the desert, Deccan basalts and Gondwana sediments, weathered and fractured granite gneisses and schists and the coastal alluvium and Tertiary sediments. The survey was carried out using state of the art equipment SkyTEM.

The paper presents a synopsis of the results of HeliTEM and HeliMAG surveys that have helped in obtaining the continuous data acquisition scanning the sub-surface in representative geological formations in India. These HeliTEM data were supported by a number of Ground Geophysical surveys viz., Ground TEM, Vertical Electrical Sounding (VES) and Electrical Resistivity Tomography (ERT). The result has provided the 3D subsurface structures controlling the groundwater conditions, the regional continuity of probable aquifers, the variations in lithological character of aquifers and the quality of water in terms of salinity. The results have been used to generate database using convenient grid size, as small as 50 m x 50 m to the proposed National Aquifer Grid (NAG) of 2 km x 2 km for the desired aquifer based groundwater management plan.

The specialized features pertaining to hydrogeological characteristics obtained from this study are as follows:

§   A very clear delineation clay beds and their spatial distribution providing the multi-layered aquifer setup in the Gnagetic plains.

§   Delineation of low resistivity zones in the quartzite underlain by an over exploited aquifers providing the possibility of new aquifers.

§   Presence of comparatively freshwater zones underneath the saline water aquifers in the thick and dry sands in deserts.

§   Clear demarcation of different lava flow, mapping the structural controls as well as highly porous zones in the contact of basalt and gondwanas.

§   A complete and continuous mapping of weathered portions in the crystalline hard rock areas providing information on the recharge zones.

§   The setting of multi-layered aquifer and different zones of salt water intrusion in the coastal sedimentary formations.

Thus the study has established an appropriate cost-effective methodology for deploying specific geophysical investigation on one hand and carried out the aquifer mapping with continuous aquifer information for performing aquifer modeling on the other hand.

Invited Speech 5: Development and Benchmark of OpenMP-Accelerated SWAT Simulations Using Open-Source Compilers and Utilities

Speaker: Prof. Albert S. Kim, University of Hawaii at Manoa, USA
Time: 11:20-12:00, Monday Morning, July 20, 2015
Location: Invited Session 1: Geology and Energy, Lotus Room(荷花厅), 4th Floor Guangdong Hotel (Shanghai)
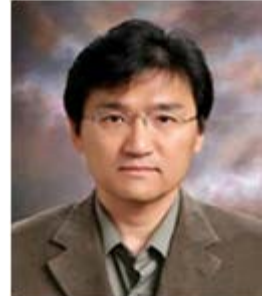
Abstract
A practical method to accelerate execution of Soil and Water Assessment Tool (SWAT) was developed using open (free) computational resources. The SWAT source code (rev 622) was parallelized using OpenMP and recompiled using a non-commercial Intel FORTRAN compiler in Ubuntu Linux platform. We used GNU utilities of'make' to build OpenMP SWAT package, 'gprof' to profile memory usage, and 'diff' to check identicalness of parallel and serial SWAT simulations. Among 302 SWAT subroutines, the slowest routines in terms of execution were identified using gprof, and later OpenMP-parallelized in an 8-core shared memory system. In addition, we developed a C-wrapping function to rapidly set large arrays zero, which was found to be very efficient. A universal speedup ratio of 2.3 was achieved when input data sets have a large number of hydrological response units.

Invited Session 2: Materials Sciences I

Invited Speech 1: Micro- and Nanostructure of LiF-Doped Polycrystalline Transparent Mg-Al-Spinel; A TEM Study

Speaker: Prof. Hans-Joachim Kleebe, the Technical University of Darmstadt, Germany
Time: 08:30-09:10, Monday Morning, July 20, 2015
Location: Invited Session 2: Materials Sciences I, Magnolia Room (白玉兰厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract
$MgAl_2O_4$ is considered a promising material for optical applications and hence object to research for more than 40 years worldwide[1]. The densification mechanism of $MgAl_2O_4$ spinel doped with lithium fluoride as a polycrystalline transparent ceramic has been intensively

studied.

LiF greatly reduces the sintering temperature and facilitates enhanced densification at low temperatures. However, the basic mechanisms behind the sintering process are still not fully understood, as neither LiF nor an additional secondary phase is detectable in the final product.

Based on individual studies Reimanis, Kleebe and Rozenburg[2-5] postulated three major processes during sintering of spinel with LiF including (i) Enhanced volume diffusion by incorporation of O-vacancies (ii) Dissolution – Reprecipitation and (iii) Wetting – Dewetting: At this early stage of sintering, the densification mechanism can be described by a classical liquid phase sintering process facilitating particle rearrangement. At temperatures above 1000°C, no secondary phase is detectable along grain boundaries. In a recent work it was shown that these mechanisms occur simultaneously interacting with each other[5], however, the verification was made by indirect methods as for example the double fringe technique for the wetting-dewetting mechanism.

The overall aims of the present study are (i) to verify the postulated mechanisms and (ii) to transfer this knowledge to a pressure less sinter process. Based on dedicated model experiments and a characterisation using e.g. state-of-the-art electron microscopy it was shown for the first time that (a) a dissolution-reprecipation process occurs at significantly lower temperatures by the formation of a variety of transient phases, (b) a vapour transport mechanism leads to a notable mass transport involving the magnesium and (c) an exaggerated grain growth of a second generation of spinel hinders the densification process.

[1]. M. Rubat du Merac, H.-J. Kleebe, M.M. Müller and I.E. Reimanis, "Fifty Years of Research and Development Coming to Fruition; Unraveling the Complex Interactions during Processing of Transparent Magnesium Aluminate ($MgAl_2O_4$) Spinel" J. Am. Ceram. Soc., 96 [11] (2013) 3341-3365.

[2]. I.E. Reimanis and H.-J. Kleebe, "A Review on the Sintering and Microstructure Development of Transparent Spinel ($MgAl_2O_4$)", J. Am. Ceram. Soc. 98 [12] (2007) pp. 1273-78.

[3]. K. Rozenburg, I.E. Reimanis, H.-J. Kleebe, and R. L. Cook, "Chemical interaction between LiF and $MgAl_2O_4$ spinel during sintering" J. Am. Ceram. Soc. 90 [7] (2007) pp. 2038-2042.

[4]. M. Rubat du Merac, I.E. Reimanis, C. Smith, H.-J. Kleebe and M.M. Mueller "Effect of Impurities and LiF Additive in Hot-Pressed Transparent Magnesium Aluminate Spinel", Int. J. App. Ceram. Tech. 10 [1] (2013) pp. E33-E48.

[5]. M.M. Müller and H.-J. Kleebe "Sintering Mechanisms of LiF-Doped Mg-Al-Spinel" J. Am. Ceram. Soc., 95 [10] (2013) pp. 3022-3024.

Invited Speech 2: Transparent Oxide Ceramics with Specific Absorption

Speaker: Dr. Jens Klimke, Fraunhofer Institute for Ceramic Technologies and Systems (IKTS), Germany
Time: 09:10-09:50, Monday Morning, July 20, 2015
Location: Materials Sciences I, Magnolia Room (白玉兰厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract

As a new class of advanced functional materials transparent ceramicshave

recently acquired a high degree of interest because of their unique combination of mechanical and optical properties. Materials with new optical properties for high-refractive index lenses, optoelectronic devices, lasers, optical filters and infrared windows can be developed with ceramics.

The transmission of dense sinteredceramics is limited by absorption and by scattering. Pores or defects and components with different index of refraction are the major factors of scattering of light in ceramics[1]. Based on simulations using Mie scattering theory the influence of scattering is discussed as a function of pore size and index of refraction. Scattering can be minimized by defect avoiding liquid shaping methods like gelcasting[2].

Our approach follows the adjustment of the spectral transmission by specific dopants. The effect of cobalt- and chromium on the transmissionof different types of transparent oxide ceramics: Al_2O_3, $MgAl_2O_4$ and cubic ZrO_2 were compared. The specific absorption allows conclusions about theposition of the dopant and the microstructure of the ceramics.

[1] Krell, A.; Hutzler, T. ; Klimke, J.: Transmission physics and consequences for materials selection, manufacturing, and applications, Journal of the European Ceramic Society 29 (2009)2, 207-221
[2] Krell, A.; Klimke, J.: Effect of the Homogeneity of Particle Coordination on Solid-State Sintering of Transparent Alumina,Journal American Ceramic Society 89 (2006) 6, 1985-1992

Invited Speech 3: Piezoelectric Nano-Manipulations

Speaker: Prof. Junhui Hu, Nanjing University of Aeronautics and Astronautics, China
Time: 09:50-10:30, Monday Morning, July 20, 2015
Location: Materials Sciences I, Magnolia Room (白玉兰厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract

Nano manipulation technology has wide potential applications in the nano

measurement and assembling, fabrication of nano sensors, treatment of biomedical samples, production of nano structured materials, etc. The piezoelectric nano-manipulation which emerges in 2012, employs the ultrasonic vibration generated by a piezoelectric vibrator to handle individual

and/or multiple nanoscale components. It has the merits such as a low temperature rise at the manipulating area, diversified manipulating functions, capability to integrate multiple manipulating functions into one device, compact and light device structure, etc. In 2012, our research group proposed and experimentally verified the principle to ultrasonically trap and transfer an individual nanowire in water in a contact way, which utilizes the acoustic streaming field around a micro manipulating probe. Since then, more piezoelectric nano-manipulation functions have been proposed and experimentally realized by our group. They include the noncontact-type trapping and transfer of individual nanowires, concentration of nano objects on an ultrasonic stage and on a still substrate, rotary driving of an individual nanowire, integration of contact and noncontact type trapping in one piezoelectric device, etc. In this report, the principles, structures and manipulating characteristics of the piezoelectric devices, proposed and developed by our group for nano-manipulations, are reviewed, and the challenges facing the piezoelectric nano manipulation technology are discussed.

Invited Speech 4: Generation of Fine Grain Layers in the Vicinity of Friction Surfaces in Metal Forming Processes: Theory and Experiment

Speaker: Prof. Sergei Alexandrov, A.Ishlinskii Institute for Problems in Mechanics of the Russian Academy of Sciences, Russia
Time: 10:40-11:20, Monday Morning, July 20, 2015
Location: Materials Sciences I, Magnolia Room (白玉兰厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract
It is well known that cracks can produce stress singularities in linear elastic materials. The stress intensity factor is one of the basic concepts in linear elastic fracture mechanics. This parameter appears in asymptotic analyses performed in the vicinity of a sharp crack-tip and is the coefficient of the singular term. In spite of the fact that the assumptions under which the stress intensity factor is determined are not satisfied in real materials (the crack-tip is not sharp and a region of inelastic deformation exists in its vicinity), this approach is effective in structural design. A similar concept in rigid plastic solids is the strain rate intensity factor. This parameter appears in asymptotic analyses performed in the vicinity of maximum friction surfaces and is the coefficient of the singular term in a series expansion of the equivalent strain rate. The stain rate intensity factor in plasticity can play a similar role to that of the stress intensity factor in elasticity. In particular, the strain rate intensity factor controls the magnitude of the equivalent strain rate in the vicinity of frictional interfaces. On the other hand, the equivalent strain rate is involved in many evolution equations for parameters that characterize material properties. Therefore, the strain rate intensity factor controls the intensity of physical processes in a narrow layer of material near frictional interfaces in processes of plastic deformation. Such layers (fine grain layers) actually appear in real metal-forming processes. This presentation concerns with general asymptotic analysis near maximum friction surfaces for several rigid plastic models which demonstrates the existence of the strain rate intensity factor. A number of available analytic solutions are used to reveal the effect of process and material parameters

on the magnitude of the strain rate intensity factor. For the models described by hyperbolic systems of equations, the strain rate intensity factor is derived in characteristic coordinates. This significantly simplifies the calculation of the strain rate intensity factor by means of numerical methods. A numerical solution for the strain rate intensity factor in compression of a plastic layer between two rough plates is presented and compared to an approximate analytical solution. Finally, results of an extrusion test designed to generate a fine grain layer in the vicinity of the friction surface are discussed.

Invited Speech 5: Preparation, Microstructuralcharacterization and Elasticproperties of Porous Mullite and Mullite-Aluminaceramics

Speaker: Dr. Eva Gregorova, University of Chemistry and Technology, Prague (UCT Prague), Czech Republic
Time: 11:20-12:00, Monday Morning, July 20, 2015
Location: Materials Sciences I, Magnolia Room（白玉兰厅）, 4th Floor Guangdong Hotel (Shanghai)

Abstract
Mullite is a major crystalline phase in many silicate-based ceramics, both traditional and advanced, and refractories. Moreover, mullite and mullite-alumina ceramics can be considered as fine-ceramic counterparts of popular coarse-grained refractory materials (sillimanite bricks, mullite bricks and high-alumina bricks). When these materials are prepared with a porous microstructure they have the additional advantage of light weight, low elastic moduli, as well as high acoustic, thermal and electric insulation capability. This contribution presents an overview on porous mullite and mullite-alumina ceramics prepared with starch and starch-based pore formers like wheat flour. The preparation by casting and direct foaming techniques is explained and microstructure characterization results are shown, including porosity (pore volume fraction), interface density, mean curvature integral density and the related grain size measures (mean chord length, Jeffries size) obtained by microscopic image analysis. The image analysis results are compared with complimentary information obtained from Archimedes measurements, mercury porosimetry and X-ray computed tomography. Finally, an overview on the elastic properties of mullite and mullite-alumina ceramics is presented, with special focus on impulse excitation measurements of the Young's modulus at high temperature and the determination of the elastic moduli and Poisson ratio at room temperature. It is shown that based on the phase composition, porosity and the experimentally determined temperature dependence master curve, the Young's modulus of alumina-mullite composites can be predicted, and that other elastic moduli can be predicted when the Poisson ratio is known. For porous mullite ceramics it is shown that the elastic moduli approach the Gibson-Ashby prediction with increasing porosity (80-90 %), but are significantly below the latter for smaller porosities (below 70 %).

Invited Session 3: Mathematics I

Invited Speech 1: Equitability and Dependence Measures

Speaker: Dr. Adam Ding, Northeastern University, USA
Time: 08:30-09:10, Monday Morning, July 20, 2015
Location: Mathematics I, Kapok Room (木棉厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract
Reshef et al. (Science, 2011) proposed the concept of equitability that measures of dependence should satisfy: treating all types of functional relationships, linear and nonlinear, equally. To this end, they proposed a novel measure, the maximal information coefficient (MIC). Recently, Kinney and Atwal (2014) showed that MIC is in fact not equitable under a strict mathematical definition, while recommending the self-equitable mutual information (MI). We propose a new equitability definition to select among self-equitable measures. The copula correlation (Ccor), based on the L_1-distance of copula density, is shown to be equitable under all equitability definitions. We also prove theoretically that Ccor is much easier to estimate than MI. Simulations and real data analyses are used to illustrate application of the equitable measures.

Invited Speech 2: Qualitative properties of the non-linear equations in porous media and application in engineering

Speaker: Prof. Akif Ibragimov, Texas Tech University, Lubbock, Texas US., USA
Time: 09:10-09:50, Monday Morning, July 20, 2015
Location: Mathematics I, Kapok Room (木棉厅), 4th Floor Guangdong Hotel (Shanghai)
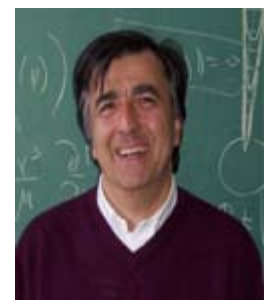
Abstract
In this lecture we will focus on the analysis of properties of the solution of non-linear equations in porous media and some engineering applications.

It has been observed for many years that the traditional linear Darcy equation does not adequately predict many important features of gas and liquid flows in the reservoir. Essentially, modern challenges in reservoir engineering introduced a new class of mathematical problems using machinery of partial differential equations. We will discuss the discovery of novel relations between

main hydrodynamic parameters of the flows in porous media and corresponding properties of the solution of degenerate parabolic equations. The study of a class of generalized non-linear momentum equation, covering pre-Darcy, Darcy and post-Darcy equations within one framework of models based on non-linear parabolic equations of second order, will be introduced.

We will also discuss qualitative properties of the solution of the corresponding equations and the relation of these theoretical results to practical engineering applications.

In our talk we will also address some unsolved important problems closely related to modern technology that has a potential to increase significantly oil and gas recoverable reserves.

Invited Speech 3: On Normalized Integral Table Algebras Generated by an

Element of Degree 3

Speaker: Prof. Zvi Arad, University St. Netanya, Israel
Time: 09:50-10:30, Monday Morning, July 20, 2015
Location: Mathematics I, Kapok Room (木棉厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract
The study of the properties of products of conjugacy classes of finite groups is an old branch of finite group theory. This topic was extensively studied in the 1980's. The book Products of Conjugacy classes in Groups, edited by Z. Arad and M. Herzog, volume 1112 of Lecture Notes in Mathematics, Springer, provides a comprehensive picture of the results obtained during this period.

It was realized by several researchers that this investigation could be extended to products of irreducible characters. This led to the notion of Table Algebra, introduced by Z. Arad and H. Blau in 1991, in order to study in a uniform way the decomposition of products of conjugacy classes Cla(G) and irreducible characters Irr(G) of finite groups G. Since then the theory of Table Algebras has been extensively developed. Today the theory of Table Algebras is an important branch of modern algebra.

In my lecture I will state the classification theorem of Normalized Integral Table Algebras (Fusion Rings) generated by a faithful non-real element of degree 3.

Invited Speech 4: Evolutionary Variational-Hemivariational Inequalities with Memory and their Applications

Speaker: Prof. Stanislaw Migorski, Jagiellonian University in Krakow, Poland
Time: 10:40-11:20, Monday Morning, July 20, 2015
**Location:** Mathematics I, Kapok Room (木棉厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract

In this talk we provide results on existence and uniqueness of solution to the evolutionary second order variational-hemivariational inequalities. We deal with a class of abstract problems which contain two potentials, at least one of them is convex, and a memory operator. The main tools are the Clarke generalized gradient, a theorem on surjectivity of a multivalued pseudomonotone operator, and a fixed point argument. The results are generalizations of some earlier contributions obtained for quasistatic problems. Then, we provide an application of abstract results to study the existence and uniqueness of the weak solutions to nonsmooth dynamic contact problems of mechanics. We con- sider the nonlinear constitutive viscoelastic law with a long memory term and general nonmonotone and multivalued subdifferential boundary conditions for the contact and friction.

Invited Speech 5: A Novel Statistical Method for Age-standardization With Applications to Marketing Researchand Public Health Studies

Speaker: Prof. Wenjiang Fu, University of Houston, USA
Time: 11:20-12:00, Monday Morning, July 20, 2015
Location: Mathematics I, Kapok Room (木棉厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract

In public health, economics, marketing research and business management, it is importantto estimate the temporal trend of disease rates, sales of products, or themarket share of a business during a period of time. Often the disease rates vary with the age of patients (e.g. cancer mortality) or the sales of products vary with the age ofconsumers (e.g. sales of cosmeticproducts or life insurance policies). To estimate the temporal trend across a number of years, asummary value (e.g. yearly rate or percentage) needs to be estimated based on a sequence of age-specific rates or percentages. However, such a task is well known to be complex because of the Simpson's paradox and becausethe age structure varies with time due to aging of the population. Thismakesthe crude rate heavily depend on the age structureand vary drastically across time periods even if the age-specific rates remain the same, resulting ininappropriatecomparison and trend

estimation. To address this issue, a direct age-standardization procedure has been employed in the literature to calculate asummary valueusing the age-structure of a standard population, such as the US 2000 population age structure.

Although this direct age-standardization method has become the "standard" procedure in marketing research, demography, sociology, and public health research, it has been criticized for the lack of theoretical justification and for generating statistical illusions. In this work, I will study the direct age-standardization method using statistical theory, point out that age-standardization inevitably introduces bias, and further provide an upper bound of such bias. In particular, I demonstrate that using the age structure of the US 2000 Standard Population leads to severe overestimation of cancer mortality and the sales of US life insurance policies.I will then introduce a novel mean reference population method, which minimizes the bias andlargelyimproves the estimationaccuracy. This method further addresses the controversy about the selection of the reference population for the age-standardization. Finally, I will discuss some related statistical issues.This is a joint work with Shuangge Ma, David Todem and Martina Fu.

Invited Session 4: Materials Sciences II

Invited Speech 1: Cross-Property Relations between the Elastic and Thermal

Properties of Porous Ceramics

Speaker: Dr. Willi Pabst, University of Chemistry and Technology, Prague (UCT Prague), Czech Republic
Time: 14:00-14:40, Monday Afternoon, July 20, 2015
Location: Materials Sciences II, Magnolia Room (白玉兰厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract
Cross-property relations are relations (in the form of equations or inequalities) between different effective (or relative) properties of two-phase materials (e.g. porous materials). Famous examples are the Levin relation between the thermal expansion coefficient and the bulk modulus, as well as the Milton-Torquato (MT) and Berryman-Milton-Gibiansky-Torquato (BMGT) cross-property bounds (elementary and translational cross-property bounds) between the elastic moduli (primarily the bulk modulus) and the (thermal) conductivity. Other very useful, albeit only approximate, cross-property relations between the relative Young's modulus and the relative conductivity of porous materials are the Sevostianov-Kováčik-Simančík (SKS) cross-property relation and the Pabst-Gregorová (PG) cross-property relation, apart from the trivial identity valid for porous materials with translational symmetry in certain directions (in-plane or axial). In this contribution all these cross-property relations between the Young's modulus and thermal

conductivity are reviewed and their respective range of validity is explained. It is recalled that, in contrast to the identity valid for certain directions of anisotropic materials, both the SKS cross-property relation and the PG cross-property relation obey the MT and BMGT bounds and are therefore admissible candidates for property prediction. It is shown that the SKS cross-property relation can be approximated (and thus in practice replaced) by a very simple cross-property relation (based on the Maxwell model or, equivalently, the Hashin-Shtrikman upper bounds) and that, although both the SKS and PG cross-property relations are principally admissible for isotropic porous ceramics, the latter seems to be more realistic for a wide range of microstructures and thus more universal. Finally it is shown that the existence and success of cross-property relations is incompatible with so-called minimum solid area models (which are still very popular in ceramic science today) and that, therefore, the latter have to be abandoned.

Invited Speech 2: Elongated Inductively Coupled Plasma Torch for Annealing Processes

Speaker: Dr. Tomohiro Okumura, Panasonic Corporation, Japan
Time: 14:40-15:20, Monday Afternoon, July 20, 2015
Location: Materials Sciences II, Magnolia Room (白玉兰厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract
ICP was first utilized as a thermal plasma in the 1960s, long before it began being used as a high density plasma source for dry etching in semiconductor processing. Since then, ICP torches have been used in the field of spray coating and spectroscopic analysis. The basic structure of a conventional ICP torch consists of a cylindrical chamber with a heat-resistant insulator, such as quartz or ceramic, and a solenoid coil around it. Recently developed has been rapid thermal processing (RTP) system using ICP. An elongated ICP torch with a racetrack chamber enables the direct irradiation of a line-shaped elongated thermal plasma on the substrate. The annealing performance has been improved by using a ceramic chamber that ensures better mechanical and thermal properties than a quartz chamber, realizing a substrate temperature higher than 1,600 K. Attempts have been made to apply instantaneous thermal processes, such as laser annealing (LA) and flash lamp annealing (FLA), to the crystallization of amorphous silicon (a-Si) thin films, the activation of doped impurity atoms in ultra-shallow junctions (USJs) or the recovery of plasma-induced damage (PID) physically created by ion bombardment. ICP torch can be an alternative technology to realize those processes as well as reducing machine costs. In the presentation, the elongated ICP torch and experimental investigations for several kinds of applications will be discussed.

Invited Speech 3: Dynamic Mechanical Properties of Oil Palm Empty Fruit Bunch and Coir Fiber Reinforced Polypropylene Hybrid Composites

Speaker: Dr. Mohammad Jawaid, Universiti Putra Malaysia, Malaysia
Time: 15:35-16:15, Monday Afternoon, July 20, 2015
Location: Materials Sciences II, Magnolia Room (白玉兰厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract
Dynamic Mechanical Analysis (DMA) is one of the most powerful tools to study behaviour of polymeric materials and it allows for quick and easy measurement of material properties. DMA measures the mechanical properties of viscoelastic materials as a function of temperature or frequency when the materials are deformed under the action of a periodic force or displacement. Hybrid composites are prepared by injection moulding technique by reinforcing coir and oil palm fibres (OPEFB) with polypropylene matrix. Designing of this kind of new materials it becomes important to measure the influence of fibre–matrix interface properties on macroscopic mechanical properties. The OPEFB/coir fibre reinforced polypropylene hybrid composite were subjected to dynamic mechanical analysis to determine the dynamic properties with special reference to the effect of fibre loading, frequency and temperature. The storage modulus E' were found to increase with weight fraction of fibre. This is due to the increased stiffness imparted by the natural fibres. The intrinsic properties of the components, morphology of the system and the nature of interface between the phases determine the dynamic mechanical properties of the composite. The loss modulus and damping peaks were found to be lowered by the incorporation of fibre up to 30 %. The height of the damping peaks found to be depended on the fibre content.

Invited Speech 4: What Future for Natural Fibres in Structured Materials

Speaker: Prof. David Bassir, University of Technology of Belfort-Montbeliard, France
Time: 16:15-16:55, Monday Afternoon, July 20, 2015
Location: Materials Sciences II, Magnolia Room (白玉兰厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract
During the last decade investigation of the mechanical properties of bio-composites materials using natural fiber has considerably evolved from basic engineering studies to more fundamental topics[1, 2]. For instance, the bio-polymer materials are considered as unavoidable alternatives for the replacement of oil based materials. The limited development of the bio-plastics market is particularly affected by the weak mechanical performance of these materials. To overcome these difficulties, one should focus on both: manufacturing process and modelling aspect. The second aspect related to

simulation is an important task in the loop of integrating new fibers in structured material. The parameters of the numerical model require indeed to be identified in order to fit the experimental testing[3, 4].

In this report two aspects will be discussed: presentation of industrial applications using natural fibers to produce advances materials structural concepts (such as the blades of offshore wind-turbine, and thermal protection panels) will be performed. Then, focus on the recent numerical tools to perform parameter identification included hybrid approaches that combine heuristic methods and neural network surface response[5]. Elasticity properties of a fully bio-degradable composite model will be defined as a numerical application.

[1] S. Guessasma, D. Bassir, L. Hedjazi, "Influence of interphase properties on the effective behaviour of a starch-hemp composite", Materials & Design, Vols, 65, Pages 1053–1063, (Elsevier), 2015.

[2] S. Guessasma, ,M. Hbib and D. Bassir, "Identification Scheme to Assess the role of interfacial damage in a Hemp-Starch Biocomposite", Advanced Materials Research, Vols. 875-877, pp. 524-528, 2014.

[3] S. Guessasma, D. Bassir, Identification of mechanical properties of biopolymer composites sensitive to interface effect using hybrid approach, Mechanics of Materials (Elsevier), Vol. 42, pp. 344-353, 2010.

[4] Guessasma, D. Bassir, Optimisation of mechanical properties of virtual porous solids using a hybrid approach, ActaMateriala, (Elsevier), Vol. 58, pp. 716-725, 2010.

[5] D. Bassir, S. Guessasma and M.L. Boubakar, Hybrid computational strategy based on ANN and GAPS: Application for identification of a non linear composite material, Journal of Composite Structures, (Elsevier), V 88, 2, pp. 262-270, 2009.

Invited Speech 5: The Growth of REBCO High Temperature Superconductor

Speaker: Prof. Xin Yao, Shanghai Jiao Tong University, China
Time: 08:30-09:10, Tuesday Morning, July 21, 2015
Location: Materials Sciences II, Magnolia Room (白玉兰厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract
For fundamental study and practical application, the growth of REBCO high temperature superconductors has been investigated in our lab; the progress is reviewed on three aspects.
1) Single crystal of REBCO with the world-record size, stoichiometry chemical composition control and superconducting properties by Top-Seeded Solution-Growth (TSSG);
2) Novel seeds and phase relation study on the growth of REBCO single domain bulk with the large size and high performance by Top-Seeded Melt-Growth (TSMG);
3) Orientation transition (out of plane, in-plane alignment), its mechanism and film properties by Liquid Phase Epitaxy (LPE).

Invited Session 5: Mathematics II

Invited Speech 1: Recent Contributions on Two-sex Branching Processes

Speaker: Prof. Manuel Molina, University of Extremadura, Spain
Time: 13:30 - 14:10, Monday Afternoon, July 20, 2015
Location: Mathematics II, Kapok Room (木棉厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract

In the general setting of stochastic modeling, branching processes are appropriate mathematical models to describe the demographic dynamics of populations whose size evolves over time, due to random births and deaths. They are an active research area of theoretical and practical interest with applicability to such fields as biology, demography, epidemiology, genetics, population dynamics, and others. Branching processes have especially played a major role in modeling population dynamics. In particular, with the purpose to model the probabilistic evolution of populations with sexual reproduction where females and males coexist and form couples (female–male), several classes of two-sex branching processes have been studied. In this talk, we will revise the recent contributions to the two-sex branching process theory and we will consider some questions for research.

Invited Speech 2: Some Recent Results on Perpetuities

Speaker: Prof. Pawel Hitczenko, Drexel University, USA
Time: 14:10-14:50, Monday Afternoon, July 20, 2015
Location: Mathematics II, Kapok Room (木棉厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract

Perpetuities are sequences in random variables, defined recursively, as successive iterations of a linear function with random coefficients. They are ubiquitous in many areas of mathematics and other branches of science and have been studied extensively in past few decades.

In this talk, after giving a background, we describe a few new results obtained in the last few years. They include, in particular, new information on the tail behavior of light-tailed perpetuities, as well as some results concerning divergent perpetuities.

Invited Speech 3: A Unified FB-SPDE with Jumps vs. A System of Coupled FB-SDEs with Skew Reflections: Theory and Applications

Speaker: Prof. Wanyang Dai, Nanjing University, China
Time: 14:50-15:30, Monday Afternoon, July 20, 2015
Location: Mathematics II, Kapok Room (木棉厅), 4th Floor Guangdong Hotel (Shanghai)

Abstract

We study four systems and their interactions. First, we formulate a unified system of coupled forward and backward stochastic partial differential equations (FB-SPDEs) with Levy jumps, which is vector-valued and whose drift, diffusion, and jump coefficients may involve partial differential operators. Under generalized local linear growth and Lipschitz conditions, the well-posedness concerning adapted strong solution to the FB-SPDEs is proved. Second, we consider a unified system of FB-SDEs, a special form of the FB-SPDEs, however, with skew reflections. Under generalized linear growth and Lipschitz conditions together with a general completely-S condition on reflection matrices, we prove the well-posedness of adapted weak solution to the FB-SDEs. In particular, if the spectral radii in certain sense for both reflection matrices are strictly less than the unity, a unique adapted strong solution will be concerned. Both the FB-SPDEs and the FB-SDEs cover their degenerated deterministic forms of FB-PDEs and FB-ODEs as special cases. Third, we formulate a stochastic differential game (SDG) problem with general number of players based on the FB-SDEs. By a solution to the FB-SPDEs, we determine a solution to the FB-SDEs under a given control rule and then obtain a Pareto optimal Nash equilibrium point to the non-zero-sum SDG problem. Fourth, we study the application of the FB-SPDEs in a queueing system and discuss how to use the queueing system to motivate the SDG problem.

Part III   Technical Sessions

Technical Session 1: Geology and Energy I

Session Chair: Dr. Shu-Qing Yang, University of Wollongong, Australia
Lotus Room(荷花厅), 4th Floor   14:00-17:00, Monday Afternoon, July 20, 2015

No.	Paper Title	Author	Affiliation
1-1 14:00-14:15	Assessments of Elastic Anisotropy of Banded Amphibolite As A Function of Cleavage Orientation Using S- And P-Wave Velocity	Esamaldeen Ali	Faculty of Petroleum And Minerals, Al Neelain University
1-2 14:15-14:30	Detection of permafrost subgrade using GPR: A case examination on Qinghai-Tibet Plateau	Zhenwei Guo	Department of Electronics and Telecommunications, Norwegian
1-3 14:30-14:45	Radon Monitoring in Groundwater and Soil Gas of Sakhalin Island	George Chelnokov	Far East Geological Institute FEB RAS
1-4 14:45-15:00	Hydrogeochemistry of thermal waters of Baransky volcano, Iturup island (Southern Kurils)	Ivan Bragin	Far East Geological Institute FEB RAS
1-5 15:00-15:15	Wind structure during mid-latitude storms and its application in Wind Energy	Xiaoli Larsén	Wind Energy Department, Technical University of Denmark
1-6 15:15-15:30	Chemical and Isotopic Composition of Water and Gas Phases from Mukhen Spa (Far East Of Russia)	Natalia Kharitonova	Moscow State University
15:30-15:45	**Coffee Break**		
1-7 15:45-16:00	The research on relationship between the soil particles and erosion characteristics under the condition of the Sieved sand slope	Tang Shanshan	Xian University of Technology
1-8 16:00-16:15	Estimation particle size of suspended load from hydrological variables	Kunxia Yu	Xian University of Technology
1-9 16:15-16:30	Soil erosion characteristics in Aeolian-fluvial interplay erosion areas	Xiang Zhang	Xian University of Technology

No.	Paper Title	Author	Affiliation
1-10 16:30-16:45	Photosynthetic Characteristics and Biomass Respond to Soil Water in Bothriochloa ischaemum	Liu Ying	Xian University of Technology
1-11 16:45-17:00	NDVI Spatial distribution pattern and correlation with Geomorphologic Factors and Land use in Dan River Watershed of Shaanxi Province, northwestern China	Zhang Jun	Xian University of Technology

Technical Session 2: Geology and Energy Ⅱ

Session Chair: Prof. Junye Wang, Athabasca University, Canada
Sakura Room (櫻花厅), 4th Floor   14:00-17:15, Monday Afternoon, July 20, 2015

No.	Paper Title	Author	Affiliation
2-1 14:00-14:15	Validation of the actuator line model for simulating flows past yawed wind turbine rotors	Wenzhong Shen	Department of Wind Energy, Technical University of Denmark
2-2 14:15-14:30	Airfoil Trailing Edge Noise Generation and Its Surface Pressure Fluctuation	Weijun Zhu	Technical University of Denmark
2-3 14:30-14:45	Unsteady Double Wake Model for the Simulation of Stalled Airfoils	Néstor Ramos García	DTU
2-4 14:45-15:00	Optimization of Liquid Ammonia Treatment for Enzymatic Hydrolysis of Miscanthus Sinensis Anderss	Liping Zhang	School of Engineering, Zhejiang A&F University
2-5 15:00-15:15	A Novel Wind Energy Conversion System with Storage for Spillage Recovery	Jie Cheng	University of Nebraska-Lincoln
2-6 15:15-15:30	Development of a Fast Fluid-Structure Coupling Technique for Wind Turbine Computations	Matias Sessarego	Technical University of Denmark
2-7 15:30-15:45	Fuzzy Estimation Analysis of Photovoltaic Model Parameters	Helal Alhamadi	College of computing Sciences, Kuwait University
15:45-16:00	**Coffee Break**		
2-8 16:00-16:15	An Experimental Study on Measurement Methods of Bulk Density and Porosity of Rock Samples	Weiren Lin	Japan Agency for Marine-Earth Science and Technology

2-9 16:15-16:30	Paleoenvironmental Implications from Biomarker Investigations on The Pliocene Lower Sajau Lignite Seam in Kasai Area, Berau Basin, Northeast Kalimantan, Indonesia	Khalda Az Zahra	Padjadjaran University
2-10 16:30-16:45	Porous Microsphere Copper Cobalt Carbonate Hydroxide as Supercapacitor Electrodes	Liu Shude	Pusan National University
2-11 16:45-17:00	1 D silver nanowire@ hierarchical NiAl layered double hydroxide core-shell architecture for pseudocapacitor	Shu Xing Wu	Pusan National University
2-12 17:00-17:15	Oligocene diabase of the Liaohe Basin, NE China: Characteristic, identification and hydrocarbon accumulation	Ang Sun	Jilin University

Technical Session 3: Materials Sciences I

Session Chair: Dr. Mohammad Jawaid, Universiti Putra Malaysia, Malaysia
Magnolia Room (白玉兰厅), 4th Floor   17:00-18:00, Monday Afternoon, July 20, 2015

No.	Paper Title	Author	Affiliation
3-1 17:00-17:15	Studies on the vibration and damping properties of high-performance fibers reinforced epoxy composites	Fei Gao	School of Materials Science and Engineering, Tianjin University
3-2 17:15-17:30	Environmental Friendly Lightweight Material From Natural Fibers of Oil Palm Empty Fruit Bunch	A. C. Arya	Universitas Trisakti
3-3 17:30-17:45	Composite Metal Nanowire Oxide Semiconductor for Transistor Application	Hsiao-Wen Zan	Department of Photonics, National Chiao Tung University, Taiwan
3-4 17:45-18:00	Influence of Boundary Conditions on Ceramic/Metal Plates under Ballistic Loads	Nadda Jongpairojcosit	Defence Technology Institute (Public Organisation)

Technical Session 4: Mathematics I

Session Chair: Prof. Manuel Molina, University of Extremadura, Spain
Kapok Room (木棉厅), 4th Floor　　　　　　15:45-18:15, Monday Afternoon, July 20, 2015

No.	Paper Title	Author	Affiliation
4-1 15:45-16:00	Evaluation of Effects of Self-Decision Selection Strategies on The Two-Armed Bandit Problem to Avoid Wrong-Side Fixation	Juan Wang	Statistical Genetics, Genomic Center, Graduate School of Medicine Kyoto University
4-2 16:00-16:15	Variable Selection and Outlier Detection for Automated K-means Clustering	Sung-Soo Kim	Korea National Open University
4-3 16:15-16:30	An Exploratory Data Analysis in Scale-Space for Interval-Valued Data	Kee-Hoon Kang	Hankuk University of Foreign Studies
4-4 16:30-16:45	Linear Profile Monitoring for an AR(1) Process	Yi-hua Wang	Tamkang University
4-5 16:45-17:00	A Goodness-of-Fit Test of Multinomial Logistic Regression Model in Case-Control Studies	Li-Ching Chen	Tamkang University
4-6 17:00-17:15	Confidence Interval for the Process Capability Index Cp Based on the Bootstrap-t Confidence Interval for the Standard Deviation	Wararit Panichkitkosolku	Thammasat University
4-7 17:15-17:30	Asymptotic Properties and Parameter Estimation Based on Two-Sided Crack Distribution	Wikanda Phaphan	Thammasat University
4-8 17:30-17:45	Some Statistical Properties and Parameter Estimation for the Two-Sided Length Biased Inverse Gaussian Distribution	Teerawat Simmachan	Thammasat University
4-9 17:45-18:00	Discriminating Between Weibull and Gamma Distributions	Orawan Supapueng	Thammasat University
4-10 18:00-18:15	The Application of Mixed Models in Analyzing Tumor Growth Data from Animal Studies	Qin Liu	The Wistar Institute

Technical Session 5: Materials Sciences Ⅱ

Session Chair: Prof. Zhong Hu, South Dakota State University
Sakura Room (櫻花厅), 4th Floor   09:10-11:55, Tuesday Morning, July 21, 2015

No.	Paper Title	Author	Affiliation
5-1 09:10-09:25	Effect of Melt Mixing Time in Internal Mixer on Mechanical Properties and Crystallization Behavior of Glycidyl Methacrylate Grafted Poly (lactic acid)	Thanh Nguyen	Suranaree University of Technology, School of Polymer Engineering
5-2 09:25-09:40	Evaluation of Filler Distribution in Particu- late Reinforced Composites	Chen Yijin	Bauman Moscow State Technical University
5-3 09:40-09:55	Nanoporous gold - polymer composites	Ke Wang	Technische Universität Hamburg-Harburg, Hamburg, Germany
5-4 09:55-10:10	Breaking The Adhesive Bond Between Dialyll Phthlate, Barco Bond Mb 185 and Pbx 9501	Emily Hunt	West Texas A&M University
10:10-10:25	**Coffee Break**		
5-5 10:25-10:40	Antimicrobial NanoAlloys for Protection	Emily Hunt	West Texas A&M University
5-6 10:40-10:55	A Modified Kelvin Model for Thermal Performance Simulation of High Mechanical Property Open-Cell Metal Foams	Chuan Zhang	University of Technology of Troyes
5-7 10:55-11:10	Design of Light-Weight and High-Strength Cellular Structural Composites	Zhong Hu	South Dakota State University
5-8 11:10-11:25	Carbon Black and Multi Wall Carbon Nano Tubes Loaded Polyurethane Foam Composite Flexible Thermal Radiator	Ravindra Wijesiriwardana	ReliSen
5-9 11:25-11:40	Stretch Forming Simulation of Woven Composites Based on an Orthotropic Non-linear Material Model	Nima Akhavan Zanjani	Australian National University
5-10 11:40-11:55	Storage Modulus Variation for MWCNT/PC Composites at Different Temperatures	Prashant Jindal	Panjab University

5-11 (poster)	Functional Supramolecular Nanofibers: From Synthesis to Applications	Chih-Chia Cheng	National Taiwan University of Science and Technology

Technical Session 6: Materials Sciences Ⅲ

Session Chair: Prof. Nikolai Bokov, Institute of Silicate Chemistry of RAS
Magnolia Room (白玉兰厅), 4th Floor   08:30-11:45, Tuesday Morning, July 21, 2015

No.	Paper Title	Author	Affiliation
6-1 08:30-08:45	Refractory Hard Alloys Elaborated by Casting of Ternary (Co, Ni Fe)-30Cr-2.5 to 5 wt.% C Compositions	Patrice Berthod	University of Lorraine, Vandoeuvre-lès-Nancy, France
6-2 08:45-09:00	Tungsten alloying – capabilities investigated by thin films characterization	Vladica Nikolic	Erich Schmid Institue of Materials Science, Austrian Academy of Sciences
6-3 09:00-09:15	Ultraslow Relaxation Process of Static Light Scattering Intensity by Boron Oxide above the Glass Transition Temperature	Nikolai Bokov	Institute of Silicate Chemistry of RAS
6-4 09:15-09:30	Vaporization and thermodynamics of glass-forming oxide melts: mass spectrometric study and modeling	Valentina Stolyarova	Saint Petersburg State University
6-5 09:30-09:45	The Application of Molecularly Imprinted Polymers	Zhao Ming	College of Environmental and Chemical Engineering, Dalian University
6-6 09:45-10:00	Investigation on the Phase Stability and Thermal Conductivity of $LaMgAl_{11}O_{19}$ Ceramic for Thermal Barrier Coating	Liu Huaifei	Central South University
10:00-10:15	**Coffee Break**		
6-7 10:15-10:30	Phase relations in Si-Al-Y-O-C Systems	Yun Ma	School of MSE, Beifang University of Nationalities

No.	Paper Title	Author	Affiliation
6-8 10:30-10:45	A Flexible Quasi-solid-state Electrochromic Device with Polymeric Electrolyte and WO3/NiO Complementary System	Jen-Yuan Wang	Institute of Nuclear Energy Research, Taoyuan 325, Taiwan
6-9 10:45-11:00	The Role of Corrugation Die Parameters on The Mechanical Properties of Aluminium Alloy (Aa 5083) Processed by Repetitive Corrugation and Straightening	Balasivanandha Prabu S	Anna University
6-10 11:00-11:15	Silver Recovery from Spent Silver Oxide Button Cell By Liquid-Liquid Extraction	Z. Gamiño-Arroyo	Universidad de Guanajuato
6-11 11:15-11:30	Use of Shore Hardness Tests for In-Process Properties	Hongyi Zhao	School of Engineering, Technology and Maritime Operations, Liverpool John Moores
6-12 11:30-11:45	The Preparation and Catalytic Performance of Nanoporous CuO/CeO_2 Composites	Caihua Wei	Xi'an Jiaotong University

Technical Session 7: Mathematics Ⅱ

Session Chair: Prof. Marco Fontana, Università degli Studi "Roma Tre" – Matematica, Italy
Lotus Room(荷花厅), 4th Floor   08:30-12:30, Tuesday Morning, July 21, 2015

No.	Paper Title	Author	Affiliation
7-1 08:30-08:45	Existence and Multiple of Positive Solution for Nonlinear Fractional Difference Equations with Parameter	Youji Xu	Department of Mathematics, Northwest Normal University
7-2 08:45-09:00	Perturbation solutions for annular flow of small gap	Cao Xiaojian	Dalian University of Technology
7-3 09:00-09:15	Uniform Convergence and Dynamical Behavior of A Discrete Dynamical System	Puneet Sharma	IIT Jodhpur
7-4 09:15-09:30	Contrast of Perspectives of Coherency	Tian Ma	Clarkson University
7-5 09:30-09:45	Sniffer Technique for Numerical Solution of Korteweg-de Vries Equation Using Genetic Algorithm	Dilip Ahalpara	Dharmsinh Desai University, Nadiad, India

7-6 09:45-10:00	Recent Progress on The Problem Concerning The Finite Character of Semistar Operations Defined by Families of Overring	Marco Fontana	Università degli Studi "Roma Tre" – Matematica
7-7 10:00-10:15	Periodic sequences of p-class tower groups	Daniel C. Mayer	Austrian Science Fund
10:15-10:30	**Coffee Break**		
7-8 10:30-10:45	Application of Volatility in Portfolio Construction	Michael Ha	Xian Jiaotong-Liverpool University
7-9 10:45-11:00	Optimal Weights in Nonparametric Analysis of Clustered ROC Curve Data	Yougui Wu	University of South Florida
7-10 11:00-11:15	Statistical Analysis of Hydrological Water Budget Parameters and Run-Off Behaviour in The Light of Climate Change in The Low Mountain Ranges in Central Germany	Frido Reinstorf	University of Applied Science Magdeburg
7-11 11:15-11:30	A Sequential Logistic Regression Classifier Based on Mixed Effects with Applications to Longitudinal Data	Jun Li	Department of Statistics, University of California, Riverside
7-12 11:30-11:45	A New Integrated Fuzzifier Evaluation and Selection (NIFEs) Algorithm for Fuzzy Clustering	Chanpaul Jin Wang, Hua Fang	University of Masschusetts Medical School
7-13 11:45-12:00	Stability Analysis of the ODE Model Representation of Amyloidogenic Processing in Alzheimer's Disease in the Presence of SORLA	Jan Harold Alcantara	De La Salle University
7-14 12:00-12:15	Population Models with Quasi-Constant-Yield Harvest Rates	Kunquan Lan	Ryerson University
7-15 12:15-12:30	Regularized Principal Component Analysis for Spatial Data	Wen-Ting Wang	National Chao-Tung University

Technical Session 8: Mathematics Ⅲ

Session Chair: Prof. Stanislaw Migorski, Jagiellonian University in Krakow, Poland
Redbud Room (紫荆厅), 4th Floor   08:30-12:15, Tuesday Morning, July 21, 2015

No.	Paper Title	Author	Affiliation
8-1 08:30-08:45	Category of Attractor and its Application	Jinying Wei	Lanzhou City University
8-2 08:45-09:00	Pullback Exponential Attractors for Nonau-Tonomous Reaction Diffusion Equations	Yongjun Li	Lanzhou City University
8-3 09:00-09:15	On No-Node Solutions of The Lazer-Mckenna Suspension Bridge Models	Fanglei Wang	College of Science, Hohai University
8-4 09:15-09:30	Solving Nonlinear Elliptic Boundary Value Problems using Time Integration and Approximate Fundamental Solutions	Haiyan Tian	The University of Southern Mississippi
8-5 09:30-09:45	New Mmodel for L^2 Norm Flow	Jiaojiao Li	Henan Normal University
8-6 09:45-10:00	Localization of Unbounded Operators on Guichardet Spaces	Jihong Zhang	School of Mathematics, Lanzhou City University
8-7 10:00-10:15	A Strong Law of Large Numbers for Set-Valued Random Variables in G_α Space	Li Guan	College of Applied Sciences, Beijing University of Technology
10:15-10:30	**Coffee Break**		
8-8 10:30-10:45	The Extinction Time in Two-Sex Branching Processes in Varying Environments	Alfonso Ramos	University of Extremadura
8-9 10:45-11:00	Extremal Limit Theorems for Heavy Tailed Processes	Istvan Berkes	Graz University of Technology
8-10 11:00-11:15	Stable Stable Solitons in A Generalized Coupled Cubic Quintic Ginzburg-Landau Equations	Emmanuel Yomba	California State University-Northridge

8-11 11:15-11:30	Nonlinear Behavior of Plasma: Connection with Nonextensive Statistics	Hui-Bin Qiu	Beijing University of Technology
8-12 **11:30-11:45**	Well-Posedness of Gaver`s Parallel System Attended by a Cold Standby Unit and a Re-pairman with Multiple Vacations	Abdukerim Haji	College of Mathematics and System Sciences, Xinjiang University
8-13 **11:45-12:00**	On Existence of Best Proximity Points And Application to Differential Equations	G Sankara Raju	Institute Institute of Technology of Ropar, Inida
8-14 **12:00-12:15**	Blow-up of Solution to Cauchy Problem for the Singularly Perturbed Sixth-Order Boussinesq-Type Equation	Song Changming	College of Science, Zhongyuan University of Technology, Zhengzhou, China

Part IV   Abstracts

Technical Session 1: Geology and Energy I

Article ID: ICGG2015Jul_40002
Title: Assessments of Elastic Anisotropy of Banded Amphibolite As A Function of Cleavage Orientation Using S- And P-Wave Velocity
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Abstract

As most rocks are of an anisotropic nature, the measurement elastic modulus of anistropic rocks is of general interest. Nevertheless, uniaxial compression test is common method to measure the dynamic elastic constants of anisotropic rocks; the use of ultrasonic pulse test is attractive, because the test is non-destructive and easy to apply. This study aimed to demonstrate the influence of orientation of foliation planes of banded amphibolite rocks on the compressional (Vp), shear wave (Vs) velocities propagating and elastic modules using ultrasonic pulse test. The result showed that the planes of foliation have a major effect on the wave velocity, where the Vp and Vs taken parallel to the foliation plane show highest values than those obtained in the other directions ($\beta = 30^{o}$, 60° and 90°). The preliminary conclusions are developed concerning that the elastic modulus is vary continuously as a function of cleavage orientation with respect to the direction of wave propagations, where Poisson's ratio having the smallest relative change. The highest values of Young's modulus and shear modulus are observed for foliation dip angles of $0°$ and the lowest values are for foliation dip angles of $90°$. This indicates that the observed intrinsic anisotropy and the close relations of the directional dependent seismic anisotropy to the foliation planes is mainly a result of crystallographic preferred orientation of major minerals (e.g. hornblende and elongated quarts grains).

Article ID: ICGG2015Jul_40006
Title: Detection of permafrost subgrade using GPR: A case examination on Qinghai-Tibet Plateau
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Abstract

Abstract: In the Qinghai-Tibet railway ballast exploration, the main purpose is to detect frozen disease by Ground penetrating radar (GPR). A new special GPR equipment was tested for the Qinghai-Tibet railway ballast exploration. For frozen disease detection on railway ballast, GPR has a high-resolution, and efficient advantages compared with other geophysical methods. It is essential guaranteed to be im-prove data processing accurately and effectively. In this paper, we employ predictive deconvolution methods to remove multiples to enhance signal noise ratio. Permafrost physical properties were stud-ied, so that permafrost recognition algorithm would be given to detect frozen disease. Firstly, we test this algorithm at Central South University by GR-III GPR, where the results were shown an effective and efficient GPR equipment and permafrost recognition algorithm chosen. According to simulation of the geological data of the typical testing section of Qinghai-Tibet railway, predictive deconvolution method removed most of multiples from synthetic data. At the end, we explored the permafrost on Qumar are on the Qinghai-Tibet

highland. A high quality interpretation was given after the data processing.

Article ID: ICGG2015Jul_40007
Title: Radon Monitoring in Groundwater and Soil Gas of Sakhalin Island

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Abstract
A groundwater radon monitoring in the southern and western part of Sakhalin Island was carried out in 2014 in order to study the correlation between radon anomalies and the seismic activity of the region. The objects of investigations were located within large tectonic dislocations of the island - the southern part of the Central Sakhalin fault and the central part of the West Sakhalin fault. The soil gas monitoring was carried out using a Sirad probe (Quarta-Rad, Russia) and the continuous radon monitoring in the groundwater was carried out using a Radon Seismic Station (CPC-05, NTM-Zashita, Russia). The effect of geochemical parameters, namely, temperature, pressure and conductivity on the radon emission has been studied. The present work contains an analytical protocol which is based on the analysis of radon emitted from the fault planes, a geochemical precursor when predicting the tectonic activity.

Article ID: HOAC2015Jul_40000
Title: Hydrogeochemistry of thermal waters of Baransky volcano, Iturup island (Southern Kurils)

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Abstract
Different types of groundwater manifestations occurring on modern structure of the Baransky volcano were studied. Volcanic and seismic activity influences strongly on hydrology and hydrochemistry of the groundwater of the watershed of Sernaya river. Three types of fluids have been established: volcan-ic-heated, steam-heated and mature. Existing model of hydrothermal system of Baransky volcano was confirmed using geothermometry and hydrochemical calculations. Thus Baransky volcano is a complex object with atmospheric recharge, deep diorite body as heat source and thick fractured altered andesitic water reservoir, where different types of water springs can emerge.

Article ID: HOAC2015Jul_40006
Title: Wind structure during mid-latitude storms and its application in Wind Energy

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Abstract
This study investigates the offshore atmospheric characteristics during storm conditions through measurements and numerical modeling. The atmospheric characteristics are described through a number of key parameters that are relevant for coastal offshore wind energy and engineering application: the mean wind and turbulence structures, as well as gust.

This study aims at improving the understanding and modeling for the challenging wind and wave conditions during storms in the coastal offshore zones where a large number of wind farms are being planned in the near future in Europe, especially in Denmark. The extreme wind and wave conditions in the coastal area for wind energy application are important but have rarely been studied in the literature.

Our experiments are done to the Danish coasts where the mid-latitude depression systems are causes of the extreme wind and wave conditions. The numerical modeling is done through an atmosphere-wave coupled system, where the atmospheric model is the Weather Research and Forecasting (WRF) model and

the wave model is the Simulating WAves Nearshore (SWAN) model. Measurements from offshore stations, Horns Rev and the FINO platform, as well as satellite wind imagines are used jointly with the numerical modeling. The point measurements include mean meteorological parameters such as profiles of wind speed and direction, turbulence and integrated wave parameters.

The behaviors of the "key" wind and wave parameters from both the measurements and the modeling will be presented. Here the "key" is referring both to the application of wind energy and the wind-wave coupling system. The various parameterization of the interface parameter for the atmospheric and wave modeling, the roughness length, has been examined. Data analysis reveals the importance of model setups (domain, initial time and resolution) and input data (large scale atmospheric forcing and bathymetry data). The wind structures were both examined for open sea and fetch limited conditions.

Article ID: HOAC2015Jul_40007
Title: Chemical and Isotopic Composition of Water and Gas Phases from Mukhen Spa (Far East Of Russia)
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Abstract
This study presents new chemical and isotopic data on the two types of cold high pCO_2 groundwaters located in the Mukhen deposit (Far East of Russia). The first type belongs to Ca–Mg–HCO_3 waters with a relatively low TDS (up to 1.7 g/l) and high concentrations of Fe_2+, Mn_2+, Ba_2+, and SiO_2. The second type is of Na–HCO_3 water with high TDS (up to 14 g/l) and elevated $Li+$, B, Sr_2+, Br–, and I–. New isotopic data of water ($\delta 18O$, δD and $3H$) and gas ($\delta 13CTIC$) phases along with a detailed geological and hydrogeological investigation of the study area allowed to identify genesis of both the mineral waters. The residence time of groundwaters were calculated as

well. It was established that the origin of the high pCO_2 groundwaters was caused by active faulting and CO_2 venting in the subsurface zone.

Article ID: HOAC2015Jul_40009
Title: The research on relationship between the soil particles and erosion characteristics under the condition of the Sieved sand slope
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Abstract
The wind-water alternate erosion was the main form of composite erosion of wind and water erosion of soil erosion crisscross region, It was meaningful to study the impact of wind-water alternate erosion on the characteristics of sediment particles for further researching the coupling mechanism of wind-water alternate erosions and environmental to erosion. By using artificial simulated rainfall experiment and research different rainfall intensity and the thickness of coated sand (length) under the condition of overburden ShaPo surface erosion and sediment particles and erosion characteristics of relationship. The results showed that the sieved sand thickness is the main factor affecting the particle composition after the slope surface coated sand; The fractal dimension of erosion and sediment particles became smaller; The slope surface coated sand increased the erosion occurrence; Erosion under different rainfall intensity and fractal dimension, d50 and MWD were not relevant, but had correlation in the thickness of 0.5 cm and sieved sand length of 3.3, 9.9 m.

Article ID: HOAC2015Jul_40011
Title: Estimation particle size of suspended load from hydrological variables
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Abstract

Establishing the relationship between particle size of suspended load and hydrological variables is a potential way to predict suspended load for ungauged watershed whose particle size of suspended load is unavailable. Suspended load, rainfall, runoff, sediment flux data in Xiliugou watershed were collected and analyzed to study the relationship between suspended load and hydrological variable. Particle size of suspended load are measured by laser particle analyzer, and the relationship between particle size of suspended load and hydrological variables is established by multiple linear regression It is indicated that intra-annual distribution of runoff and sediment flux is different from each other. Monthly runoff in both snow-melting period (March) and flood period (July and August) have peak values, but only monthly sediment flux in flood period have a peak value. The particle size characteristics of suspended load are also different in snow-melting period and flood period. The median size of suspended load in snow-melting period is 0.067 mm, while median size of suspended load in flood period is 0.17 mm. It can be concluded that coarse sediment is mainly transported in flood period in Xiliugou. The particle size of suspended load in one individual flood is related to precipitation, flood peak, and sediment discharge, and the estimated multiple linear regression relationship between median size of suspended load and the three variables have quite high accuracy.

Article ID: HOAC2015Jul_40012

Title: Soil erosion characteristics in Aeolian-fluvial interplay erosion areas

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Abstract

Aeolian-fluvial interplay erosion areas have multiple erosion dynamics and physical sources, and sediment characteristics are complex. ^{137}Cs is always employed as tracer element to study the soil erosion process since its distribution is only influenced by physical process. Sediment deposited in the grassland, uncultivated land, farmland, river channel and river bank in Dongliugou watershed were collected as samples, and the ^{137}Cs content and particle size of the samples were measured to analyze the soil erosion characteristics and estimate the amount of soil erosion. Both the ^{137}Cs content and median size of sediments decreases step by step upstream to downstream, and they are quite different from site type to site type. ^{137}Cs content of sediment deposited in the left bank is larger than the right bank in the upstream, while sediments deposited in the downstream present the opposite case. The descending order of ^{137}Cs content of sediment deposited in different site types is grassland, river bank, farmland, uncultivated land, and river channel, while the descending order of median size is river channel, uncultivated land, grassland, river bank, and farmland. The erosion modulus of these site types range between 4962.75 and 11579.62（t/km•a）. Soil erosion in the grass belongs to middle intensity erosion, and all other site types are identified as intensity erosion and violent intensity erosion。The average erosion modulus of Dongliugou watershed is 7839 t/km•a。

Article ID: HOAC2015Jul_40013

Title: Photosynthetic Characteristics and Biomass Respond to Soil Water in Bothriochloa ischaemum

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Abstract

In order to study the grassphysiological characteristics and biomass response toward different soil water conditions in high erosion region, this paper selected a typical native species (*Bothriochloaischaemum*(L.)Keng.,)in loess hilly-gully region and investigated the physiological characteristics and biomass variances under three water treatments (WW-80 ％ FC,MWS-60% and WS-40 ％ FC).Results indicated that: 1)the diurnal

changes of *Bothrichloaischaemum*net photosynthetic rate presented a double-peak pattern curve under adequate water condition. Both mild water stress and water stress treatments presented a single-peak pattern curve, showing obvious middaydepression of photosynthesis. Water stress significantly reduced the daily mean photosynthesis rate and intensified the midday photosynthesis depression，suggesting that water was the primary factor for limiting photosynthesis of *Bothriochloa ischaemum*.2)Sufficient water supply (WW treatment) can significantly increase the maximum net photosynthesis rate (Pn).Grass growth condition light intensitywas alsobroadened significantlywhen well watered.3)In well water treatment, photosynthetic active radiation was the most important factor in affected Pn, which was the direct effect. While leaf temperature was the most important factor under water stress treatments, which was the indirect effects of atmospheric water vapor pressure deficit.4) Both MWS and WS could significant influence photosynthesis and as a result decrease plant biomass. Plane up ground part was more vulnerable toward water stress than the root. More fine roots were grown when coarse roots biomass decreased under limited water.

Article ID: HOAC2015Jul_40015

Title: NDVI Spatial distribution pattern and correlation with Geomorphologic Factors and Land use in Dan River Watershed of Shaanxi Province, northwestern China

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Abstract

The vegetation coverage and spatial pattern was an important factor to effect on soil erosion and soil water loss. In order to reveal the spatial distribution pattern of vegetation coverage in Dan River Watershed of Shaanxi Province, northwestern China, MODIS 250-m NDVI date and GIS technology were used to obtain spatial distribution features of the different NDVI degree in the case of elevation, slope degree and slope direction in Dan River Watershed via overlap of distribution maps of NDVI and landform element maps extracted from digital elevation model. The results showed: (1) The average NDVI was 0.85,which indicated that the ecological environment was better in Dan River Watershed. (2) The high-NDVI distributed in marginal areas of watershed, northeast and southeast, while low-NDVI distributed in the Dan River valley, especially in city area. The moderate-NDVI distributed in between of them. (3) In the different elevation, the average NDVI increased with increasing altitude. the distribution of maximum area percent of high, moderate and low-NDVI was in 1000-1200 m,800-1000 m, 400-600 m,respectively. (4) In the different slope degree, the average NDVI and the slope of high, moderate and low coverage ratio change is not obvious, the flatland of the minimum average NDVI and area ratio is almost close to zero. (5) Under the different slope direction, the average NDVI and area percent of different NDVI degree, except flatland, did not change significantly.(6) In the different elevation, slope degree, the high and moderate-NDVI was significantly correlated with farmland, forestland and grassland, but low-NDVI was significantly correlation with construction land, unused land and waters. Moreover, at different slope direction different NDVI degree was not significant correlation with land use type. These conclusions can provide policy evidence and theory support for making regional plan of soil and water conservation, and treatment of soil erosion and water loss in Dan River Watershed of Shaanxi Province, northwestern China.

Technical Session 2: Geology and Energy Ⅱ

Article ID: NESD2015Jul_40003

Title: Validation of the actuator line model for simulating flows past yawed wind turbine rotors

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Abstract

The Actuator Line/Navier-Stokes model is validated against wind tunnel measurements for flows past the yawed MEXICO rotor and past the yawed NREL Phase VI rotor. The MEXICO rotor is oper-ated at a rotational speed of 424 rpm, a pitch angle of -2.3^o, wind speeds of 10, 15, 24 m/s and yaw angles of 15°, 30° and 45°. The computed loads as well as the velocity field behind the yawed MEXICO rotor are compared to the detailed pressure and PIV measurements which were carried out in the EU funded MEXICO project. For the NREL Phase VI rotor, computations were carried out at a rotational speed of 90.2 rpm, a pitch angle of 3°, a wind speed of 5 m/s and yaw angles of 10° and 30°. The computed loads are compared to the loads measured from pressure measurement.

Article ID: NESD2015Jul_40004

Title: Airfoil Trailing Edge Noise Generation and Its Surface Pressure Fluctuation

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Abstract

In the present work, Large Eddy Simulation (LES) of turbulent flows over a NACA 0015 airfoil is performed. The purpose of such numerical study is to relate the aerodynamic surface pressure with the noise generation. The results from LES are validated against detailed surface pressure measurements where the time history pressure data are recorded by the surface pressure micro-phones. After the flow-field is stabilized, the generated noise from the airfoil Trailing Edge (TE) is predicted using the acoustic analogy solver, where the results from LES are the input. It is found that there is a strong relation between TE noise and the aerodynamic pressure. The results of power spectrum density show that the fluctuation of aerodynamic pressure is responsible for noise generation.

Article ID: NESD2015Jul_40005

Title: Unsteady Double Wake Model for the Simulation of Stalled Airfoils

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Abstract

In the present work the recently developed UnSteady Double Wake Model, USDWM, is used to simulate separated flows past a wind turbine airfoil at high angles of attack. The solver is basically an unsteady two-dimensional panel method which uses the unsteady double wake technique to model flow separation and its dynamics. In this paper, the calculated integral forces have been successfully validated against wind tunnel measurements for the FFA-W3-211 airfoil. Furthermore, the computed highly unsteady flow field is analyzed in detail for a set of angles of attack ranging from light to deep stall conditions.

Article ID: NESD2015Jul_40014

Title: Optimization of Liquid Ammonia Treatment for Enzymatic Hydrolysis of Miscanthus Sinensis Anderss

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Abstract

Miscanthus biomass yield high, high photosynthetic efficiency, fast growth, easy breeding, widely distributed, is suitable as raw materials for the production of fuel ethanol.In this paper, the method of the pretreatment of liquid ammonia for Miscanthus, using the pretreatment of liquid ammonia to overcome biomass recalcitrance, adding cellulase enzyme, and the monosaccharide content is determined by using high performance liquid chromatography (HPLC).Effect of pretreatment process on the enzyme solution effect of awn, conducts the research to the water processing rate, temperature, residence time, amount of ammonia, the amount of H_2O_2 parameters. Data shows that, in the moisture content of 80 %, temperature 130 ^{o}C, loading amount of ammonia 2:1, residence time 10min, the glucan and xylan enzyme conversion rate are 73.23 % and 73.28 % respectively. After a mass balance, dry base mans per 100 g can get glucose 28.96 g and xylan 17.25 g.

Article ID: NESD2015Jul_40016
Title: A Novel Wind Energy Conversion System with Storage for Spillage Recovery

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Abstract

This paper proposes a new configuration for integrating a compressed air energy storage system with a conventional wind turbine. The proposed system recycles the mechanical spillage of blades and stores it for later electricity generation with assistance from a rotary vane machine. The configuration and operational policy is explained, and a comparative case study shows that the proposed system recovers investment costs through savings on electricity procurement and revenue through power export.

Article ID: NESD2015Jul_40002
Title: Development of a Fast Fluid-Structure Coupling Technique for Wind Turbine Computations

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Abstract

Fluid-structure interaction simulations are routinely used in the wind energy industry to evaluate the aerodynamic and structural dynamic performance of wind turbines. Most aero-elastic codes in modern times implement a blade element momentum technique to model the rotor aerodynamics and a modal, multi-body, or finite-element approach to model the turbine structural dynamics. The present paper describes a novel fluid-structure coupling technique which combines a three-dimensional viscous-inviscid solver for horizontal-axis wind-turbine aerodynamics, called MIRAS, and the structural dynamics model used in the aero-elastic code FLEX5. The new code, MIRAS-FLEX, in general shows good agreement with the standard aero-elastic codes FLEX5 and FAST for various test cases. The structural model in MIRAS-FLEX acts to reduce the aerodynamic load computed by MIRAS, particularly near the tip and at high wind speeds.

Article ID: NESD2015Jul_40017
Title: Fuzzy Estimation Analysis of Photovoltaic Model Parameters

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Abstract

One of the challenges in accurately estimating Photovoltaic (PV) cell electric performance is the uncertainty of the model equivalent circuit parameters. The parameters considered in the study are the series

resistance, shunt resistance, and diode ideality factor. Parameter estimation for the PC cell equivalent circuit model is challenging due to the implicit transcendental relationship of the I-V characteristics of the cell. This paper presents a fuzzy logic based study for estimating the uncertainty of the cell parameters. The model parameters change with temperature and irradiance, are the source of uncertainties. Mathematical programming is used to estimate the fuzzy parameters. The approach is performed on practical data and the results of the analysis provide the estimation of the PV model parameters. Results show that the influence of uncertainty on the parameters can vary widely.

Article ID: ICGG2015Jul_40024
Title: An Experimental Study on Measurement Methods of Bulk Density and Porosity of Rock Samples

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Abstract

Density and porosity are fundamental and important physical properties of rocks in various ge-ological problems, and affect the other physical properties. Therefore, measurements of density and porosity of rock samples are important investigation items in both geo-science and geo-engineering areas. Several measurement techniques of the density and porosity are availa-ble and being applied currently. To ensure the data quality and to conduct its quality assessment, comparison of measurement results by different measurement techniques is necessary since the techniques are based on different principles and test procedures. In this study, we collected eight types of rock samples including a gabbro, a granite, four sandstones, a welded tuff and a mudstone as study materials, and also prepared several metal specimens for the experimental comparison. The porosities of the eight rocks covered a very wide range from 0.3 % to 50 % approximately. We employed three methods

(caliper, buoyancy and helium-displacement pyc-nometer) to measure volumes of regularly-shaped specimens and to determine their bulk densi-ties and porosities. As a result, the three techniques yielded almost same bulk densities and po-rosities for all the specimens. In addition, we also applied mercury intrusion porosimetry to measure density and porosity as well as to determine pore size distribution of the rock samples. Porosity values obtained by the porosimetry method were underestimated in the case of high-porosity (soft) rock samples and overestimated for the very low-porosity rock samples. Ability to determine pore size distribution, however, is a very important advantage of the po-rosimetry method.

Article ID: ICGG2015Jul_40023
Title: Paleoenvironmental Implications from Biomarker Investigations on The Pliocene Lower Sajau Lignite Seam in Kasai Area, Berau Basin, Northeast Kalimantan, Indonesia

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Abstract

Pliocene age lignites from Lower Sajau seam, from borehole in Berau Basin, Northeast Kalimantan, Indonesia were investigated with respect to organic geochemistry by HPLC, GC and GC/MS. The analysis was conducted to drilling sequence of Kasai Coal Field, Berau Basin which has been applied to identify organic sources and maturity of organic matter. The result of normalized yields of the soluble organic matter (SOM) data indicates saturated and aromatic proportion of hydrocarbon are very low (under 10%), this was reflecting that lignite coal is still in immature stage. Moreover, biomarker hydrocarbon such as diterpenoids was not found from the sample that indicates absence of gymnosperm precursor in the paleo-peat. In contrast, there was great abundance of terpenoid biomarkers including ursane and olenane showing domination of angiosperms indicate that

angiosperm was dominated vegetation source. There also hopanoid biomarkers explaining acidic epositional environment in coal formation and microbes-affected conditions in peat formation process. Ratio of Tm/Ts shows paleomire where ratios value of Tm/Ts is in range of oxide condition.

Article ID: NESD2015Jul_40020

Title: Porous Microsphere Copper Cobalt Carbonate Hydroxide as Supercapacitor Electrodes

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Abstract

Porous microspherescopper cobalt carbonate hydroxide ($Cu_xCo_{2-x}CH$) pseudocapacitive electrode material comprised of nanoplates via a facile hydrothermal method is presented. Significantly, the crystalline structure, morphology and electrochemical performance of the $Cu_xCo_{2-x}CH$ can be readily manipulated by varying the Cu/Co molar ratios. Among various stoichiometries of CuxCo2-xCH porous microspheres studied, $Cu_{1.79}Co_{0.21}CH$ consisted of nanoplates with a mean thickness of ~ 35 nm showed a high specific capacitance of 789 F g^{-1} at a current destiny 1 A g^{-1} and retained 49.6% of capacitance at 10 A g^{-1}. Furthermore, the optimized $Cu_{1.79}Co_{0.21}CH$electrode also exhibited remarkable high cycling stability, ca 91.7% after 1000 charge-discharge cycles at current density of 5 A g^{-1}. These excellent electrochemical performances indicate that $Cu_xCo_{2-x}CH$ is a promising candidate for high performance supercapacitor applications.

Article ID: NESD2015Jul_40011

Title: 1 D silver nanowire@ hierarchical NiAl layered double hydroxide core-shell architecture for pseudocapacitor

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Abstract

Electrochemical energy storage (EES) in the form of batteries and supercapacitors is extensively used for powering the portable personal electronics and for the electrification of the transportation sector. Pseudocapacitors have effectively filled the power/energy gap between the conventional capacitors and batteries, making it the most perspective EES. Pseudocapacitance arises on account of the relation between the extent of charge acceptance and the charge of potential. Three faradaic mechanisms can result in the capacity (i) underpotential deposition, (ii) redox pseudocapacitance (iii) intercalation pseudocapacitance.

Electrode materials and its structures play a vital role in controlling the performance of the pseudocapacitors. Layered double hydroxides (LDHs) are well-known hydrotalcite-like anionic clays with the general formula $[M^{II}_{1-x}M^{III}_x(OH)_2]^{x+}[A^{n-}]_{x/n}•mH_2O$, where M^{II} and M^{III} denote the layers of divalent and trivalent metallic ions, respectively, and A^{n-} is an interlayer anion. LDH materials are highly acclaimed pseudocapacitance materials due to their intriguing features including the versatility in matrix composition, high redox activity, low cost, and environmental benignity. However, limited by poor electrical conductivity and aggregation of active species, satisfactory capacitance performance has rarely been achieved. Recently, 1 D materials have been reported to be promising electrode materials owing to the sufficient exposed surface and fast ion transfer, and direct channels for electron transport. Therefore, integration the LDH with 1D Ag nanowire in a core/shell architecture could effectively utilize both components' merits and display a potential synergistic effect. To the best of our knowledge, 1D silver nanowire@LDH core/cell architecture has not yet reported the pseudocapacitive performance.

In this communication, we employed hydrothermal method to fabricate 1D silver nanowire@hierarchicalNiAl layered double

hydroxide core-cell architecture (Ag NW@NiAl LDH) for pseudocapacitors. The unique design of core/shell heterostructure possesses multiple apparent advantages, as described below: (I) 1 D silver nanowire with excellent electrical conductivity facilitates the direct transport of electrons; (II) hierarchical NiAl LDH is grown on the surface of 1 D silver nanowire, which would provide high specific surface area and improved electrolyte diffusion; (III) vertically grown LDH surfaces along 1 D silver nanowire reduces the structural collapse and agglomeration of LDH, which may lead to a high level of reversibility and thus long cycle life; (IV) the rational combination of two individual constituents can exhibit synergic properties.

Article ID: ICGG2015Jul_40011

Title: Oligocene diabase of the Liaohe Basin, NE China: Characteristic, identification and hydrocarbon accumulation

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Abstract

Based on 3555 m logging segment and core & debris of diabase from 41 wells, 560 km^2 3D seismic data. Through identification of 86 rock slices, establish the geological properties-Logging / seismic response relationship, study diabase lithology, facies and logging recognition feature of diabase of Eastern Sag, Liaohe Basin, achieve well constraints - seismic mapping, explore the spatial distribution and accumulation regularity of diabase. Diabase is wholly crystalline with porphyric-like texture, phenocrysts are plagioclase and clinopyroxene, effective reservoir space are mainly secondary dissolved pores and fractures. Diabase could be divided into two sub-facies: centrality and border, favorable reservoir is inclined to be distributed in border sub-facies. Characteristic of logging of diabase is high resistivity and low acoustic time whose shape of curve is smooth or slight sawtooth, and characteristic of seismic of diabase is high amplitude, middle - low frequencies and fine continuity of phase axis. Vertically, diabase is distributed in Formation Shahejie Member Ⅲ and Formation Shahejie Member Ⅰ, and there are two kind of original occurrence of invasion: layer-parallel and layer- transgress, and two kind of transformedoccurrence of invasion: saucer - shaped and fault - block. Distribution of diabase is controlled by the main strike - slip fault (Jiazhangsi fault and Jiadong fault), and there are two intrusive manners associated with fault: unilateral invasion and bilateral invasion. The distance of invasion is1.3 km to 5.6 km (average:2.6 km) , thickness of the intrusions is 49 m to 165 m(average: 112 m).The intrusive age of diabase is late Dongyingperiod.The diabase isproduct of volcano – hydrothermal effects.Secondary pore causing by fluid - rock interaction is a critical factor for formation of diabase reservoir."Interface reservoir" is mainly regularitiesofoil & gas pool formation of diabase.

Technical Session 3: Materials Sciences I

Title: Studies on the vibration and damping properties of high-performance fibers reinforced epoxy composites

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Abstract

Nowadays, with the rapid development of technology, reducing vibration noise has attracted the attention from all walks of life, Developing the damping materials combining structure and function has important significance for both the civil and military fields. The aim of this study is to explore how to improve the vibration damping properties of the composites by optimal structure and interface design.In this study, The two-dimensionally (2D) braided Carbon/Kevlar hybrid fiber reinforced epoxy composites (CF/KF/EP) were prepared through resin transfer molding (RTM) process, and the influences of CF surface modification, fiber orientation angle and fiber hybridizing on their mechanical and vibration damping properties were also studied systematically.

Results shows that, appropriate CF surface oxidation treatment can improve the fiber surface activity, the mechanical properties and the inherent frequency of the composites is improved. Different fiber orientation angle of the carbon fiber laminated composites show different bending performance and vibration damping characteristics. Unidirectional CF reinforced composites show higher inherent frequency and lower damping performance, But if the fiber orientation angle is 45°/-45°, the composites axial intensity is reduce, and show lower bending performance and high damping performance. In the 2D-CF/KF/EP composites, CF and KF mixed laminated can change the bending properties of the composites, at the same time, because of the hybrid effect caused by mixed interface can make composites damping performance is improved. When the carbon fiber volume content (VCF) was 15 %, the damping loss factor (η) reached 0.048, more than the value calculated by mixed law. With mixed interface number has a greater influence on the damping loss factor of composites, while the type of the outermost layer fiber has obvious effects on the natural frequency of the composites.

Through the above research：As the new structural and functional material, Carbon/Kevlar hybrid fiber reinforced epoxy composites has good mechanical properties and damping performance,and in addition it also has the advantages of light weight, high strength, corrosion resistance, outstanding designability and simple molding process,which can be directly used to make vibration components. On the other hand,since the material has obvious anisotropy and the structural controllability, it makes the vibration damping performance designed easily. So the material has a very wide range of application, almost involved in all walks of life. Since the end of the 20th century,it has been widely used in aerospace, transportation, construction, sports, medical and other fields.

Title: Environmental Friendly Lightweight Material From Natural Fibers of Oil Palm Empty Fruit Bunch

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Abstract

Indonesia is the most producer of crude palm oil (CPO) worldwide with production more that 25 million tons in 2013. Through increasing production of CPO the wastes generated are growing up as well. The empty fruit bunch of oil palm (EFB) is one of the solid waste (biomass) which is generated at the palm oil mill. Its amount is equivalent to the CPO production, but only about 50 % of its weight are good fibers for further

usage as industrial raw material. The EFB fiber consists an interesting honey comb/lightweight structure. By mixing the EFB natural fiber with bio binding agent based on potato the environmental friendly materials (biocomposites) can be produced which are 100 % biodegadrable. The biocomposites with 2 mm thickness have strengthness about 7 GPa according to the 3 points bending test standard of DIN 53 457. After coating process the environmental friendly lightweight materials with density less than 0,4 g/cm^3 will be ready to be implemented for different technical applications.

Article ID: ACM2015Jul_40004
Title: Composite Metal Nanowire Oxide Semiconductor for Transistor Application

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Abstract
In this report, we introduce a high performance oxide thin film transistor with active layer of composite metal nanowire and oxide semiconductor. By incorporating metallic nanowire into the indium-gallium-zinc-oxide layer, we successfully increase the effective mobility upto 100 cm2/Vs. We also notice that the mobility is significantly influenced by the orientation of directional nanowires. By using XPS analysis, we found that the reaction between oxide semiconductor and the metallic nanowire helps to stabilize the nanowire structure to undergo the following high temperature (400 ^{o}C) thermal annealing. The thus formed alloy may also lead to a good lifetime (more than 100 days without encapsulation) of the very high mobility. The concept is also extended into solution process oxide TFT fabrication by incorporating metallic nanowire into sol-gel IZO processing.

Article ID: CST2015Jul_40001
Title: Influence of Boundary Conditions on Ceramic/Metal Plates under Ballistic Loads

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Abstract
Ceramic/metal plate is one of the most widely used light weight armors, especially to protect armor piercing (AP) bullet. Experimental investigation of projectile penetration mechanism into the ceramic/metal plate requires costly sensitive equipment to capture impact phenomenon that completes within microseconds. Alternatively, the impact mechanism can be efficiently investigated using numerical simulations. Among recent investigations on the protective capability of this ceramic/metal plates, few only discussed the influence of the boundary effects on the ballistic protection. This study thus aims to examine the effect of boundary conditions by changing shapes of the plate, border constraints and bounded materials in numerical simulation. Material models of the ceramic and the backing metal plate made of alu-minium 2017-T6 are selëcted. The 7.62 AP projectile's core was modeled by a solid cylinder. The initial projectile velocity was 940 m/s. The plates are represented by either a square or a hexagonal tile. The edges of the plates were fixed or enclosed by a soft epoxy. To investigate the effect of backing plate, a small gap was introduced between some of the ceramic and aluminum interfaces. The results showed that the hexagonal tiles reduce the deformation of the backing plate. The plates bounded by the epoxy exhibit inferior performances compared to the fixed plates. Finally, the small gap between the ceramic and the aluminum interfaces significantly increases the time to stop the projectile.

Technical Session 4: Mathematics I

Article ID: iCSA2015Jul_40004

Title: Evaluation of Effects of Self-Decision Selection Strategies on The Two-Armed Bandit Problem to Avoid Wrong-Side Fixation

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Abstract

Exploitation-exploration dilemma in two-armed bandit is a well-known problem in many fields and is a realistic problem in clinical medicine settings where one out of two treatments should be selëcted with only limited information, e.g. very rare diseases. Relative random assignments with various probabilistic index functions have been proposed to avoid wrong-side fixation, which is the unfavorable phenomenon of dilemma, where the majority selëct the inferior arm in the long run. These probabilistic strategies are against individuals will. In this study we aim to respect every individuals' self-choice as well as to avoid wrong-side fixation. Therefore we defined two types of selëction strategies for two arms with binomial outcomes, both of which selëct one of two arms deterministically with different index functions, representing two types of individuals; both strategies used beta distribution as the posterior and the first strategy was based on the expected success rate of it and the second on the probability that the beta distribution has success rate more than or equal to a target one. We evaluated their effects on the fixation phenomenon with two methods, exact probability calculation for small sample sizes and Monte Carlo Simulation for sufficiently large sample size, and identified potentially useful patterns for practical usage.

Article ID: iCSA2015Jul_40006

Title: Variable Selection and Outlier Detection for Automated K-means Clustering

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Abstract

The crucial problems of K-means clustering are deciding the number of clusters and initial centroids of clusters. And one of the most important problems in cluster analysis is the selëction of variables that define cluster structure, while eliminating noisy variables that mask such structure. Also outlier detection is a fundamental task while doing cluster analysis. Here we provide an automated K-means clustering process combined with variable selëction and outlier identification. The automated K-means clustering consists of three processes: (i) automatically deciding the cluster number and initial cluster center whenever a new variable is added, (ii) selëcting variables defining cluster structure in a forward manner, (iii) identifying outliers for each cluster depending on the used variables. For deciding cluster number, we used two-stage K-means procedure. To selëct variables, we applied VS-KM (variable-selëction heuristic for K-means clustering) procedure. To identify outliers, we used hybrid approach combining clustering based approach and distance based approach. We provide program implemented using R. Experimental results using real data sets and simulation data sets indicate that the proposed automated K-means clustering procedure is effective at selëcting variables and identifying outliers.

Article ID: iCSA2015Jul_40008

Title: An Exploratory Data Analysis in Scale-Space for Interval-Valued Data

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Abstract

With the rapid advancement of computing technology and storage capacity, both the size of data and the complexity of their structure have significantly increased. These enormous data are some-times converted into new types of data such as intervals. The interval-valued data contain richer information than single-valued data in the sense that they provide both center and range infor-mation of the underlying structure. Conventionally, these two attributes have been studied sepa-rately as traditional tools can be readily used for single-valued data analysis. One could apply a nonparametric smoothing technique to lower and upper bounds, or to centers and ranges separately, but it does not fully utilize the information available in the data, and it could be difficult to interpret separate analyses, and thus it is imperative to develop appropriate statistical methodologies for these data sets. Therefore, we propose a unified data analysis tool that attempts to capture the relationship between response and covariate by simultaneously accounting for variability present in the data. It utilizes a kernel smoothing approach, which is conducted in scale-space so that it considers a wide range of smoothing parameters rather than selëcting an optimal value. It also visually summarizes the significance of trends in the data as a color map across multiple locations and scales. In order to make statistical inference that accounts for the variation in interval-valued data we propose three different ways of constructing a confidence interval at each location and at each scale by combining bootstrap and Monte Carlo resampling schemes. We demonstrate its effectiveness as an exploratory data analysis tool for interval-valued data using simulated and real examples.

Article ID: iCSA2015Jul_40009
Title: Linear Profile Monitoring for an AR(1) Process
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Abstract

In most control chart applications, the quality of a process can be adequately represented by the distribution of some important quality characteristics. However, in some applications the quality of a process or product is better characterized and summarized by a functional relationship between a response variable and one or more explanatory variables. A collection of this kind of data points is called a profile. Profile monitoring is used to understand and to check the stability of this relationship or curve over time. The independence assumption for the error term is commonly used in the existing simple linear profile models. In this study, we focus on a simple linear profile model but there is a first order autocorrelation between profiles. We propose different monitoring statistics and derive their control limits for phase II monitoring. The proposed methods are shown to have good performance in the simulation study based on the ARL criterion.

Article ID: iCSA2015Jul_40010
Title: Confidence Interval for the Process Capability Index Cp Based on the Bootstrap-t Confidence Interval for the Standard Deviation
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Abstract

This paper proposes a confidence interval for the process capability index based on the bootstrap-t confidence interval for the standard deviation. A Monte Carlo simulation study was conducted to compare the performance of the proposed confidence interval with the existing confidence interval based on the confidence interval for the standard deviation. Simulation results show that the proposed confidence interval perform well in terms of cov-erage probability in case of more skewed distributions. On the other

hand, the existing confidence interval has a coverage probability close to the nominal level for symmetrical or less skewed distributions.

Article ID: iCSA2015Jul_40012

Title: Asymptotic Properties and Parameter Estimation Based on Two-Sided Crack Distribution

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Abstract

In this paper we propose a new family of the two-sided crack distribution. The theoretical properties of the two-sided crack distribution is established. Also, we develop and investigate the method of moments of parameters estimation. Asymptotic statistical properties of the proposed estimators are also developed. A Monte Carlo simulation and real data study are conducted to appraise the performance of the proposed estimators for given sample sizes by using R program for evaluation.

Article ID: iCSA2015Jul_40014

Title: Some Statistical Properties and Parameter Estimation for the Two-Sided Length Biased Inverse Gaussian Distribution

Name: T. Simmachan, K. Budsaba, A. Volodin, P. Nilkorn
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Abstract

The new lifetime distribution based on non-classical parametrization model which is called the two-sided length biased inverse Gaussian distribution is introduced. The physical phenomena of this situation can be explained in the case when a crack develops from two sides. Some statistical properties of the distribution such as reciprocal properties and the first four moments are investigated. The conventional point estimation method, method of moment estimation, is developed to estimate the parameters of the distribution together with asymptotic analysis of the proposed estimators. In order to evaluate the performance of the suggested estimators, Monte-Carlo simulation studies are conducted. Additionally, real life examples based on published data are used to illustrate the presented estimation method in a practical setting. Concluding remarks and discussions are also presented.

Article ID: iCSA2015Jul_40023

Title: The Application of Mixed Models in Analyzing Tumor Growth Data from Animal Studies

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Abstract

In preclinical cancer research, animal experiments are used to investigate the effect of a new drug on inhibiting tumor growth. Human tumor xenograft mouse model or tumor cell line mouse model are often taken in the animal experiments. Tumor volumes in mouse body are measured at baseline and multiple time points after treatment. T-test and ANOVA are common methods applied in biological lab to compare the treatment effect at the last follow-up time point. These methods frequently fail to declare a significant result even though an obvious different tumor growth trends were shown from the longitudinal data. To gain study power, linear or nonlinear mixed models with the random effect at mouse level are proposed to examine the differences in tumor growth trends between treatment groups. A couple of real data analyses are used as examples to demonstrate the advantages of these models compared with simple t-test or ANOVA. Statistical programming and output in Stata software are provided for these examples.

Technical Session 5: Materials Sciences Ⅱ

Article ID: ACM2015Jul_40005

Title: Effect of Melt Mixing Time in Internal Mixer on Mechanical Properties and Crystallization Behavior of Glycidyl Methacrylate Grafted Poly (lactic acid)

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Abstract

Glycidyl methacrylate (GMA) was grafted onto poly (lactic acid) (PLA) by melt mixing in internal mixer using dicumyl peroxide (DCP) as an initiator. The results from proton nuclear magnetic resonance (1H-NMR) and Fourier transform infrared (FTIR) spectroscopy indicated that the grafting reaction of GMA onto PLA took place successfully. The impact strength of PLA-g-GMA was significantly higher than that of pure PLA. The crystallinity of PLA, obtained from differential scanning calorimetry (DSC), decreased after grafting. In order to obtain the optimal mixing conditions, the mixing time was varied into 7, 10 and 14 min. The optimum mixing time of 10 min was found to give the optimum mechanical properties of glycidyl methacrylate grafted poly (lactic acid) (PLA-g-GMA). However, the mixing time played no important role in impact behavior of PLA-g-GMA. In addition, the highest crystallinity was obtained with the PLA-g-GMA prepared with the mixing time of 7 min.

Article ID: ACM2015Jul_40006

Title: Evaluation of Filler Distribution in Particulate Reinforced Composites

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Abstract

Aluminum matrix particulate reinforced composites are of significant interest to industry, but it's difficult to provide stable properties for this group of material. The mechanical properties of met-al matrix composites are deeply influenced by the distribution of reinforcement particulates in the matrix. In this paper uniformity of SiC particles distribution in Al-based composites produced by stir casting and powder metallurgy technique are assessed. Analysis is carried out by means of classical and computer quantification metallographic image analysis methods. In addition, we suggest set hardness distribution in cross section of samples as an indicator of reinforcement dis-tribution uniformity in the matrix.

Article ID: ACM2015Jul_40008

Title: Nanoporous gold - polymer composites

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Abstract

Nanoporous metal synthesis via dealloying provides mm- or cm-sized monolithic samples consisting of a homogeneous network structure of nanoscale "ligaments" with uniform size that can be controlled down to well below 10 nm. The strength of the ligaments increases with decreasing size, attaining the theoretical strength of the metal at ligament diameters in the lower nanometer region. Here, we explore an novel materials design strategy that combines this high-strength and uniform metallic network structure with an interpenetrating polymer phase to obtain a strong, lightweight and highly deformable composite material[1]. We demonstrate that cm-sized samples can be made, affording compression, bending and tension tests. These studies reveal, for the first time tensile

ductility in a nanoporous-metal based material.
Compared to the behavior of pure nanoporous metal, the composite shows a drastic increase in strength. The flow stress can be decomposed into components from polymer and metal. Our analysis is based on a rule of mixture for the stresses, which is unexpectedly simple and has not been considered previously in the field of small-scale plasticity. While the strength of porous metal scales with its solid fraction with a power law of 3/2, the metal fraction enters the rule of mixture as a linear term. The results of the stress decomposition are in quantitative agreement with the data for flow stress versus ligament size which have been derived from tests on the nanoporous metal. This validates a theoretical complement to the important empirical implication of our work: While the high strength of nanoscale metal objects is fascinating but rather of academic interest, our materials design strategy allows exploiting this strength in a material, that is, in a substance from which macroscopic things can be formed in technology.

[1]: K. Wang and J. Weissmüller, Composites of Nanoporous Gold and Polymer, Adv. Mater. 25 (2013) 1280.

Article ID: ACM2015Jul_40009
Title: Breaking The Adhesive Bond Between Dialyll Phthlate, Barco Bond Mb 185 and Pbx 9501

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Abstract
Use of epoxy as an adhesive is a common practice in high explosive or polymer-matrix composite materials. The most common applications are permanent sealants. Epoxies have a wide range of operating temperatures, and are very resistance to adhesive failure. When a need to remove this adhesive arises, it is not always easily accomplished especially if the part has excessive adhesive. To maintain fidelity of the parts attached by epoxy, a project evaluating several methods of epoxy removal was conducted. Methods evaluated included low wavelength, near- ultraviolet radiation, solvent dissolution, and thermal cycling. The UV method failed to demonstrate a repeatable dissociation. The solvent study did result in dissociation of bonds, but introduced chemicals that could make subsequent chemical analysis of parts suspect. Thermal cycling showed a high repeatability for dissociation of bonds and may prove to be relatively inexpensive to implement. Additionally modeling evaluating the heat flow through materials during thermal cycling is also evaluated.

Article ID: ACM2015Jul_40012
Title: Antimicrobial NanoAlloys for Protection

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Abstract
Corrosion is a leading cause of pipe failure and is a main component of the operating and maintenance costs of gas industry pipelines. It is well recognized that chemical and microbial mechanisms both contribute to corrosion, and it has been estimated that 40 % of all internal pipeline corrosion in the gas industry can be attributed to microbial corrosion. Currently, oil and gas companies do not have many choices in prevention of internal pipe corrosion. Many producers spend significant money each month to flush the pipes with various chemicals and biocides to kill off the sulfur-producing bacteria. Researchers at West Texas A&M University have developed a new coating that can be applied to the inside of a pipe and will prevent microbial corrosion for up to a year. Unlike other paints or chemicals that are currently on the market, this nano-coating is activated through combustion synthesis and forms a metallic alloy on the inside of a pipe. Using nano-silver in conjunction with other nano-scale metals, the coating enhances temperature, abrasion, and corrosion resistance as well. In experiments designed to test for resistance, 99 percent of bacteria that were exposed to the activated

nano-coated surface died. This technology is currently being marketed with appropriate translational work from the university research laboratory to a company and market production.

Article ID: ACM2015Jul_40010
Title: A Modified Kelvin Model for Thermal Performance Simulation of High Mechanical Property Open-Cell Metal Foams

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Abstract
This paper proposes a modified Kelvin model for high mechanical property open-cell metal foams and investigates its application in thermal simulations. The thermal conductivity is simulated based on the steady state method and the results are consistent with experimental values. The melting process of phase change materials (PCMs) in Kelvin model and its modified model is numerically investigated under a temperature constant heat resource. By detecting the temperature variations, it shows that the metal foam greatly improves the heat transfer in energy storage systems. Besides, the comparison of the melting process in two foam models indicates that the systems based on high mechanical property metal foams have a shorter melting time. The melting process of paraffin in modified Kelvin metal foam models with three different porosities (65 %, 70 % and 75 %) are numerically analyzed and compared.

Article ID: ACM2015Jul_40003
Title: Design of Light-Weight and High-Strength Cellular Structural Composites

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Abstract
Ultra-lightweight and high strength materials and

structures have the potential to revolutionize aerospace systems and capability, and have many potential applications. Cellular materials are of significant interest to the materials research community as they offer high strength-to-weight ratio, high stiffness, high permeability, excellent impact-absorption, and thermal and acoustic insulation, and often possess multifunctional physical properties. Periodic cellular composites are of particular interest as they offer great flexibility in tailoring specific physical properties by controlling the compositions and/or microstructures of the constituent phases.

Design: Conventional design methods based on trial-and-error have been found cumbersome and time consuming. In cellular material design, biomimetics looks to natural cellular structures for inspiration. Nature has optimized microstructural layouts of material over millennia of evolution. The trick for researchers is to determine what the materials have been optimized for (including the specific environmental conditions), and how to scale up for actual engineering applications. Examples of natural periodic cellular materials include nacre, cuttlebone, bamboo, bone, and cork. Therefore, the ideas behind biomimetics, an effective approach to design cellular periodic materials, will be introduced, which can encompass the essential aspects in materials design, system engineering, and even business models.

Fabrication: Material design barely works without a prototyping technique. Due to the complex internal geometry, manufacturing a component with cellular meso-structure is impossible with traditional subtractive machining. Processing technologies are rapidly advancing and manufacturers now have the ability to control material architecture, or topology, at unprecedented length scales. This expands the design space and provides exciting opportunities for tailoring material properties through design of the material's topology. Using a 3D printing technology to fabricate test samples to verify computational models is a new idea, especially for printing composite materials with

stiff fillers (e.g. continuous or discrete carbon fibers, or tiny silicon carbide "whiskers") within a soft matrix (polymer). Of particular significance is the way that fibers can be aligned, through control of the fiber aspect ratio (the length relative to the diameter) and the nozzle diameter. This marks an important step forward in designing engineering materials that mimic wood or bone, long known for their remarkable mechanical properties for its weight. Material options within the 3D printing space have expanded quite significantly over the past year, as companies have begun to realize that the potential that 3D printing provides and the practicality behind the technology are limited by the materials currently available. Recent reports identified several new carbon fiber-based materials for use in fused filament fabrication / fused deposition modeling (FFF/FDM) 3D printers. These include Ultem and PEEK FDM filaments with chapped carbon fibers, carbon fiber PLA, ABS, and Nylon, in addition to other innovative 3D printing products, such as high-performance 3D printing filament made using multi-wall carbon nanotubes for electronics applications.

Characterization: Characterization of such materials is an important process, permitting examination of their physical and mechanical properties. Mechanical tests provide insights into material properties, basic mechanical tests for composites and cellular structural composites will be introduced. However, it is not necessarily ideal for testing natural materials in their optimum environment. Alternatively, mathematical and numerical models can be assist mechanical characterization of such natural materials. This approach is more versatile, allowing refinement of the loading and environmental conditions to better appreciate both the ideal workings of the material and to assess how the beneficial features of the material can be adopted to different engineering applications. In this context, computational topology design and characterization has become a prevalent tool in the fields of structural and material design. The author will also review the fundamental evaluation/characterization methodology for the traditional composite materials and the approach will be extended to the periodic cellular composites. Typical identical base cells or representative volume elements (RVEs) will be identified. The homogenization technique will be introduced. The key idea behind this method is considering a periodic material structure based on RVEs and treating the RVE's parameters as design variables. The effects of manipulating the topology of the phase distributions on the properties will be discussed. Therefore, a relationship between local material parameters (e.g. the density and topology of the RVEs) and global physical properties (e.g. Young's modulus or conductivity) can be established to enable structure design and characterization.

Article ID: ACM2015Jul_40014
Title: Carbon Black and Multi Wall Carbon Nano Tubes Loaded Polyurethane Foam Composite Flexible Thermal Radiator

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Abstract
Carbon black (CB) or multi walled carbon nanotubes (MWCNT) loaded polyurethane conductive foams are used as heaters, electrodes, radar absorbers and shielding. This paper discusses the performance of an innovative flexible thermal radiator (FTR) constructed with CB filled or MWCNT filled conductive foam and powering electrode structure constructed with textiles manufacturing process (knitting, weav-ing or nonwoven). Silver (Ag) yarns are used for the powering electrodes construction. This paper dis-cusses the construction, electro-thermal analysis, performance and applications of FTR. Also this paper compare the thermal and electrical characteristics of CB filled and MWCNT filled FTRs. The elec-tro-thermal model is simulated by using finite element methods.

Article ID: ACM2015Jul_40001
Title: Studies on The Vibration and Damping Properties of High-Performance Fibers Reinforced Epoxy Composites
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Abstract

Nowadays, with the rapid development of technology, reducing vibration noise has attracted the attention from all walks of life, Developing the damping materials combining structure and function has important significance for both the civil and military fields. The aim of this study is to explore how to improve the vibration damping properties of the composites by optimal structure and interface design.In this study, The two-dimensionally (2D) braided Carbon/Kevlar hybrid fiber reinforced epoxy composites (CF/KF/EP) were prepared through resin transfer molding (RTM) process, and the influences of CF surface modification, fiber orientation angle and fiber hybridizing on their mechanical and vibration damping properties were also studied systematically.

Results shows that, appropriate CF surface oxidation treatment can improve the fiber surface activity, the mechanical properties and the inherent frequency of the composites is improved. Different fiber orientation angle of the carbon fiber laminated composites show different bending performance and vibration damping characteristics. Unidirectional CF reinforced composites show higher inherent frequency and lower damping performance, But if the fiber orientation angle is 45°/-45°, the composites axial intensity is reduce, and show lower bending performance and high damping performance. In the 2D-CF/KF/EP composites, CF and KF mixed laminated can change the bending properties of the composites, at the same time, because of the hybrid effect caused by mixed interface can make composites damping performance is improved. When the carbon fiber volume content (VCF) was 15%, the damping loss factor (η) reached 0.048, more than the value calculated by mixed law. With mixed interface number has a greater influence on the damping loss factor of composites, while the type of the outermost layer fiber has obvious effects on the natural frequency of the composites.

Through the above research：As the new structural and functional material, Carbon/Kevlar hybrid fiber reinforced epoxy composites has good mechanical properties and damping performance,and in addition it also has the advantages of light weight, high strength, corrosion resistance, outstanding designability and simple molding process,which can be directly used to make vibration components. On the other hand,since the material has obvious anisotropy and the structural controllability, it makes the vibration damping performance designed easily. So the material has a very wide range of application, almost involved in all walks of life. Since the end of the 20th century,it has been widely used in aerospace, transportation, construction, sports, medical and other fields.

Article ID: ACM2015Jul_40011
Title: Storage Modulus Variation for MWCNT/PC Composites at Different Temperatures
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Abstract

Multi-walled Carbon Nanotubes(MWCNTs) were used as filler materials in Polycarbonate(PC)/MWCNTs composites and tested under various loading frequencies at different temperature conditions. Composites MWCNTs(2 wt%, 5 wt% and 10 wt%) in PC were fabricated using simple solution mixing method and Dynamic Mechanical Analysis(DMA) of these composites was performed under a temperature range of 300 to 1000 °C. It was observed that with increase in temperatures from 300 to 1000 °C the average storage modulus increased by more than 35 % for 10wt% MWCNT/PC composite in comparison to pure PC. Mechanical behavior of polymer composite materials

with change in temperature under variable loading frequency is significant for various engineering applications where decomposition of constituent materials at high temperature can lead to material failure.

Article ID: ACM2015Jul_40016

Title: Functional Supramolecular Nanofibers: From Synthesis to Applications

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Abstract

A new concept to supramolecular assembly of functional electrospun fibers, capable of forming network-like polymeric clusters through complementary hydrogen-bonding interactions, has been exploited. A novel diamidopyridine-functionalized poly(3-thiophene) (PTDAP) and a high molecular weight poly1-(4-vinylbenzyl uracil) (PVBU) are prepared to exhibit high complementary ability in thin solid film and fiber states owing to the formation of uracil-diamidopyridine (U-DAP) pairs by induced hierarchical self-assembly. When the mixing ratios of PTDAP/PVBU deviate from the stoichiometric ratio, the mix can be electrospun into well-defined supramolecular nanofibers with fabric diameters (ranging from 200 to 1270 nm) forming at different PTDAP loadings. These observations suggest that the one-dimensional nanostructures of the PTDAP/PVBU complex are readily tailored. In addition, the PTDAP/PVBU behaves as an effective chromophore that greatly enhances the light emission efficiency of fluorescent fibers, reaching up to three times higher efficiency than those of the control, PTDAP/PS fibers.

Technical Session 6: Materials Sciences Ⅲ

Article ID: RHM2015Jul_40000

Title: Refractory Hard Alloys Elaborated by Casting of Ternary (Co, Ni Fe)-30Cr-2.5 to 5wt.%C Compositions

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Abstract

Three series of ternary alloys of the {M-30Cr-xC}-type with M=Co, Ni or Fe and x ranging from 2.5 to 5 wt.% were elaborated by casting. Their microstructure characterizations by XRD and SEM show that very high volume fractions in chromium carbides (even more than 50 %) may be obtained in a metallic matrix by this way. However graphite may also appear in very low quantities in the carbon-richest alloys. The hardness increases with the carbon content (up to 1000 Hv 30 kg) but it may be a little lowered when graphite is also present. The results show that very hard alloys may be simply obtained by casting of rather cheap elements.

Article ID: RHM2015Jul_40002

Title: Tungsten alloying – capabilities investigated by thin films characterization

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Abstract

Tungsten (W), a metal with excellent high temperature properties and many superlatives, is widely used in extreme high temperature environments. However, the limiting factor for various applications is its inherent brittleness at low temperatures and its high ductile – to – brittle transition temperature. One of the approaches when dealing with ductility enhancement is the synthesis of a tungsten solid solution – alloys.

In the presented work, a magnetron sputter deposition process was used to deposit thin films of W – binary alloys with a certain compositional gradient, on a 200 µm cold – rolled tungsten substrate. In this way, a wide range of alloys can be obtained on a single substrate and a unique investigation of the exact influence of a certain alloying element on the mechanical properties can be performed. Three alloys were studied: W – Fe (0-6 at %), W – Ti (0-12 at %) and W – Ir (0-10 at %), all with the film thickness between 1-3 µm. A scanning electron microscope equipped with electron backscattered diffraction detector was used to determine the microstructure of the alloys, analyse the texture and the grain orientation, and to investigate the variation of the microstructure in respect to the alloying content. Different heat treatments reveal a significant grain growth above 1300 °C with a clear texture transition when reaching higher temperatures. The chemistry of the regions of interests was determined using energy dispersive X – ray spectroscopy and the mechanical characterization was done by means of 3 – point bending experiments.

Article ID: GST2015Jul_40002
Title: Ultraslow Relaxation Process of Static Light Scattering Intensity by Boron Oxide above the Glass Transition Temperature

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Abstract
The data describing the changes of the polarized Vv component of the integral intensity of light scattering above the glass transition temperature of boron oxide at the observation angle of 90° obtained by using the temperature jump methods are presented. It was established that the stabilization of the glass at the temperature 200 °C resulted in the increasing of the anisotropic intensity and at the same time the isotropic intensity was represented certain decreasing. It was shown that after temperature jump to the temperature 3200 °C the polarized Vv component intensity was characterized by the formation of a maximum, which was in agreement with the results obtained for other oxide glasses. It was found that the relaxation time of the height of the maximum intensity was equal 50 min approximately, that was more than two order of magnitude of the structural relaxation time for this temperature.

Article ID: GST2015Jul_40003
Title: Vaporization and thermodynamics of glass-forming oxide melts: mass spectrometric study and modeling

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Abstract
Information on the vaporization processes and thermodynamic properties of glass-forming oxide melts in the systems $MgO-B_2O_3-SiO_2$, $CaO-B_2O_3-SiO_2$, $SrO-B_2O_3-SiO_2$, $BaO-B_2O_3-SiO_2$, $PbO-B_2O_3-SiO_2$, $CdO-B_2O_3-SiO_2$, $ZnO-B_2O_3-SiO_2$, $Bi_2O_3-B_2O_3-SiO_2$ and $Bi_2O_3-GeO_2-SiO_2$ together with the earlier obtained data is discussed. These data were obtained by high-temperature mass spectrometric method. Various types of vapor species were found over oxide systems studied such as the associated, dissociated and polymerized products of vaporization. The regularities of the vaporization of the binary and multicomponent glass-forming oxide melts were illustrated and discussed from the point of view of the

acid-base concept. Results on determination of thermodynamic functions in oxide systems were considered taking into account the main requirements for the confirmation of their reliability. The generalized lattice theory of associated solutions was used for the calculation of thermodynamic properties of the ternary silicate melts studied. Using this approach the different levels of deviations from the ideality in the melts under investigation were clarified. The relative numbers of bonds of various types formed in the melts considered were also calculated based on the generalized lattice theory of associated solutions. The financial support to the current study was gratefully acknowledged to the Russian Fund for Basic Research according to the project N 13-03-00718.

Article ID: MME2015Jul_40001
Title: The Application of Molecularly Imprinted Polymers
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Abstract
Molecularly imprinted technology (MIT) has the characteristics of specificity and high selëctivity, that is one of the most promising methordologies. Besides, the polymers are made using MIT as the functional material of solid-phase extraction and chromatographic fractionating and sensor, because of the characteristics of the high selëctivity, the better stability and easy preparation. This review introduce the progress in the application of MIT and summarized its application in the chemistry.

Article ID: CST2015Jul_40000
Title: Investigation on the Phase Stability and Thermal Conductivity of LaMgAl$_{11}$O$_{19}$ Ceramic for Thermal Barrier Coating

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Abstract
Lanthanum magnesium aluminate (LaMgAl$_{11}$O$_{19}$) powder was prepared by chemical co-precipitate method using aluminium nitrate, magnesium nitrate and lanthanum nitrate as metal ion salt solution and ammonium hydroxide as precipitant. The ceramic powder with single LaMgAl$_{11}$O$_{19}$ phase was obtained after calcining the precursor powder at 1550 °C for 10 h. LaMgAl$_{11}$O$_{19}$ possesses excellent phase stability which keeps its original phase even after aged at 1600 °C for 150 h. LaMgAl$_{11}$O$_{19}$ also shows lower thermal conductivity than the most successful thermal barrier coating material 8 wt.%Y$_2$O$_3$-stabilized ZrO$_2$ (8YSZ) due to the hexagonal plate-shaped microstructure of LaMgAl$_{11}$O$_{19}$ crystals. Between room temperature and 800 °C, the thermal conductivity of LaMgAl$_{11}$O$_{19}$ compacts (1.49-1.58 W/m•K) is obviously lower than that of 8 YSZ (1.91-1.73 W/m•K). In the temperature range of room temperature to 1400 °C, the average thermal expansion coefficient of LaMgAl$_{11}$O$_{19}$ (8.95×10^{-6}/K) is slightly lower than that of 8YSZ (10.42×10^{-6}/K), but similar to that of alumina, which may contributes to good match between LaMgAl$_{11}$O$_{19}$ and thermally grown oxide layer (TGO) and long lifetime during thermal cycling for thermal barrier coating application.

Article ID: CST2015Jul_40003
Title: Phase relations in Si-Al-Y-O-C Systems
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Abstract
The present work investigated the phase relations in SiC-Al$_2$O$_3$-Y$_2$O$_3$-SiO$_2$ (Si-Al-Y-O-C) system. As a continuation of our previous works，the purpose of this study is to understand the high temperature

reaction behaviors of SiO_2 in the system and its effect on the phase relations of the valuable system of $SiC-Al_2O_3-Y_2O_3$. The phase compositions of six solid-state reacted samples with different components of $Y_2O_3 : Al_2O_3 : SiC : SiO_2$ were analyzed by XRD. The phase relations of the systems were determined. The subsolidus phase diagrams of ternary $Al_2O_3-SiC-SiO_2$ system and the tentative phase diagram of an extended quaternary $Y_2O_3-Al_2O_3-SiC-SiO_2$ system were presented latter involving several coexisting regions of four phases. The high temperature reaction behavior of SiO_2 in the system and its effect on the phase relations of system were discussed.

Article ID: MPT2015Jul_40003

Title: A Flexible Quasi-solid-state Electrochromic Device with Polymeric Electrolyte and WO$_3$/NiO Complementary System

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Abstract

A flexible quasi-solid-state electrochromic device (ECD), assembled with a polymeric crystal com-posite electrolyte and tungsten oxide/nickel oxide (WO$_3$/NiO) complementary system, is demon-strated in this study. The polymeric crystal composite electrolyte, which is composed of a UV-cured ethoxylated trimethylolpropane triacrylate (ETPTA), propylene carbonate (PC) and ferrocene (Fc), is used as the polymeric electrolyte in the flexible quasi-solid-state ECD. The optimal composition ration of this composite is at the weight ratio of 15/85 for ETPTA/PC with 1 M LiTFSi. For the cathodic electrochromic electrode, a flexible polyethylene terephthalate (PET) is used as the substrate, and indium–tin–oxide (ITO) and WO$_3$ are deposited sequentially on the PET by sputtering. A NiO/ITO/PET electrode prepared by sputtering is used as the anodic coloring elec-trode. The thickness of ITO, WO$_3$ and NiO film is 110, 70 and 60 nm, respectively. This flexible all-solid-state ECD fabricated with the polymeric crystal composite electrolyte shows an optical contrast of ca. 36.1 % at 600 nm. The optical transmittance of the ECD at 600 nm can be reversibly modulated from 46.2 % (bleached) to 10.1 % (darkened), by applying potentials of 2.5 and -2.5 V, respectively.

Article ID: MME2015Jul_40007

Title: The Role of Corrugation Die Parameters on The Mechanical Properties of Aluminium Alloy (Aa 5083) Processed by Repetitive Corrugation and Straightening

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Abstract

The microstructure and mechanical properties of Aluminium alloy (AA 5083) processed through Repetitive Corrugation and Straightening (RCS) are studied. The RCS process consists of corrugating a flat specimen with a pair of systematically grooved dies and straightening was done with two parallel flat dies. The aluminium samples were subjected RCS process using two different die sets namely truncated V groove dies (die 1) whose breath=height=5 mm and θ=30° and another set of dies with circular profile with radius=10 mm (Die 2) both having different die parameter. The specimens were subjected to maximum 8 passes. The grain refinement is studied form the microstructure examination using EBSD and TEM. The mechanical properties such as Tensile strength, Hardness and the grain size were compared. The Tensile strength and Hardness found to be increasing with respect to the number of passes. The tensile strength increased up to 25 % in the sixth pass when compared to the parent material. But the strength and hardness values were reduced at 8th pass due to the surface cracks. The EBSD analysis showed the significant grain refinement in the alloy. The studies showed that the Die - I is superior to Die - II for

grain refinement.

Article ID: MME2015Jul_40003
Title: Silver Recovery from Spent Silver Oxide Button Cell By Liquid-Liquid Extraction

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Abstract

Button cell batteries are used in clocks, thermometers, remote controls, toys and other devices, and they are usually discarded in the trash once its useful life is over. Some models of these batteries contain silver oxide. In this paper we propose liquid-liquid extraction as separation process to recover the metal. First, silver determination is performed in different models of these batteries and leaching with nitric acid is carried out. Affinity study is done between several commercial extractants for silver. The best performing extractant is the bis(2-ethylhexyl) dithiophosphoric acid (D2EHDTPA). Furthermore, a study of the extraction yields as a function of extractant concentration and time is performed. The distribution isotherm is determined; complex extracted in organic phase and stripping conditions have been identified. With the aim of obtaining industrial application, a number of steps for a countercurrent process were defined by the McCabe-Thiele method. Finally, a study was done in micropilot scale. The results show that it is possible to recover silver from this type of waste.

Article ID: MPT2015Jul_40001
Title: Use of Shore Hardness Tests for In-Process Properties

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Abstract

Casting is an important rubber manufacturing process for both production and material developments. A quick and flexible way of testing the constitutive materials properties of rubber products is very important for optimising the processing parameters and quality control. In many cases, standard testssuch as tensile or compression testsare timeconsuming and require a large volume of materials. This work reports some recent workin using a combined numerical and experimental approach to characterise the properties of rubber materialsduring a casting process. Durometer shore hardness is used to test silicone rubbers (as a model material) with different compositions on different moulding planes and the linear elastic property is estimated from the hardnesses.The predicted properties are systematically compared with the experimental tests on hard and soft silicone rubber samples with different compositions. The work shows that shore hardness can be used as an effective way to monitorthe materials properties during amoulding process for process optimisation and quality control.

Article ID: MME2015Jul_40004
Title: The Preparation and Catalytic Performance of Nanoporous CuO/CeO$_2$ Composites

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Abstract

Nanoporous CuO/CeO$_2$ ribbons are successfully prepared through dealloying melt-spun Al$_{80-x}$Cu$_{20}$Ce$_x$(x=0.5, 1, 2, 3, at%) alloy in a 5 wt% NaOH aqueous solution, followed by calcining in air. The samples are characterized by XRD, SEM, EDS, HRTEM, Raman and gas chromatograph. For the dealloyed melt-spun Al80- $_x$Cu$_{20}$Ce$_x$ (x=0.5, 1, 2, 3, at%) alloy, the XRD results indicate that Cu and Cu$_2$O are formed，while CuO and CeO$_2$ are formed coupled with calcinations. The SEM shows that the CuO/CeO$_2$ ribbons with a homogeneous pore/grain structure are thermally stable up to 873 K because uniform CeO$_2$

particles are dispersedly loaded on the fine CuO grains of the porous structure, which is validated by TEM again. Meanwhile, the Raman spectra show that the concentration of oxygen vacancies reach a maximum value when the calcining temperature at 873 K. In addition, the gas chromatograph results show that the dealloyed $Al_{78}Cu_{20}Ce_2$ ribbons with calcined at 873K have the best active catalysis for CO oxidation and the rates of CO conversation reaching at 50 % and 100 % are 423 K and 593 K ,respectively, owing to the synergetic effects of the CuO and CeO_2 species.

Technical Session 7: Mathematics Ⅱ

Article ID: CODEDS2015Jul_40007

Title: Existence and Multiple of Positive Solution for Nonlinear Fractional Difference Equations with Parameter

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Abstract

Let $1< v \leq 2$, $\lambda > 0$. We study the existence and multiple positive solutions of v –th nonlinear discrete fractional boundary value problem of the form

$-\Delta^v u(t) = \lambda f(t + v - 1, u(t + v - 1))$,

$u(v - 2) = 0 = u(v + b + 1)$.

By using a fixed-point theorem on cone, the parameter intervals of problem is established.

Article ID: CODEDS2015Jul_40010

Title: Perturbation solutions for annular flow of small gap

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Abstract

The perturbation method is used to solve the control equations of a three-dimensional annular flow inside a small gap. The nonlinear equations are separated into zeroth-order and first-order perturbation equations. The velocity and pressure distributions are solved successively by different numerical methods with the zeroth-order and first-order equation. Agreement in results is found with the present method and software ANSYS-CFX, which illustrates the applicability of perturbation method in solving complicated flow field inside small gaps.

Article ID: CODEDS2015Jul_40013

Title: Uniform Convergence and Dynamical Behavior of A Discrete Dynamical System

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Abstract

In this paper we study the dynamical behavior of a system approximated uniformly by a sequence of chaotic maps. We give examples to show that properties like sensitivity and denseness of periodic points need not be preserved under uniform convergence. We derive conditions under which some of the dynamical properties of the maps are preserved in.

Article ID: CODEDS2015Jul_40016

Title: Contrast of Perspectives of Coherency

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Abstract

Mixing and coherence are fundamental issues at the heart of understanding

fluid dynamics and other non-autonomous dynamical systems. Recently the notion of coherence has come to a more rigorous footing, in particular, within the studies of fnite-time nonautonomous dynamical systems. Here we recall \shape coherent sets" which is proven to correspond to slowly evolving curvature, for which tangency of finite time stable foliations (related to a forward time" perspective) and finite time unstable foliations (related to a backwards time" perspective) serve a central role. We compare and contrast this perspective to both the variational method of geodesics [17], as well as the coherent pairs perspective [12] from transfer operators.

Article ID: CODEDS2015Jul_40017

Title: Sniffer Technique for Numerical Solution of Korteweg-de Vries Equation Using Genetic Algorithm

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Abstract

A novel heuristic technique has been developed for solving Ordinary Differential Equation (ODE) numerically under the framework of Genetic Algorithm (GA). The method incorporates a sniffer procedure that helps carry out a memetic search within the solution domain in the vicinity of the currently found best chromosome. The technique has been successfully ap-plied to the Korteweg-de Vries (KdV) equation, a well-known nonlinear Partial Differential Equation (PDE). In the present study we consider its solution in the regime of solitary waves, or solitons that is first used to convert the PDE into an ODE. It is then shown that using the sniffer technique assisted GA procedure, numerical solution has been successfully generated quite efficiently for the one-dimensional ODE version of the KdV equation in space variable (x). The technique is quite promising for its applications to systems involving ODE equations where analytical solutions are not directly available.

Article ID: ICGA2015Jul_40000

Title: Recent Progress on The Problem Concerning The Finite Character of Semistar Operations   Defined by Families of Overring

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Abstract

In the present talk, I will discuss recent progress done by several authors concerning one of the problems listed in the paper "One hundred problems in commutative ring theory" by S. Chapman and S. Glaz (appeared in "Non-Noetherian Ring Theory", Kluwer Academic Publishers, Dordrecht NL, 2000).

The original problem was stated in the following form:

let $\{R_\alpha | \alpha \in \mathcal{A}\}$ be a family of overrings of a given integral domain R with quotient field K and let $\star_\alpha$ be asemistar operation defined on R_α, for each $\alpha \in \mathcal{A}$. Let $\star_\alpha$ be the semistar operation on R, defined, for each nonzero R--submodule E of K, as follows:

$$E^{\star_\mathcal{A}} := \bigcap \{(E\,R_\alpha)^{\star\alpha} | \alpha \in \mathcal{A}\}$$

Find conditions, on $\mathcal{A}$ and on $\{(\,R_\alpha,\,\star_\alpha)\,|\,\alpha \in \mathcal{A}\,\}$,

for $\star_\mathcal{A}$ to be of finite character.

Article ID: ICGA2015Jul_40003

Title: Periodic sequences of p-class tower groups

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Abstract

Recent examples of periodic bifurcations in descendant trees of finite p-groups with $p \in \{2, 3\}$ are used to show that the possible p-class tower groups G of certain multiquadratic fields K with p-class group of type (2,2,2), resp. (3,3), form periodic sequences in the descendant tree of the elementary abelian root C_2^3, resp. C_3^2. The particular vertex of the periodic sequence which occurs as the p - class tower group G of an assigned field K is determined uniquely by the p-class number of a quadratic, resp. cubic, auxiliary field K, associated unambiguously to K. Consequently, the hard problem of identifying p-class tower group G is reduced to an easy computation of low degree arithmetical invariants.

Article ID: iCSA2015Jul_40030

Title: Regularized Principal Component Analysis for Spatial Data

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Abstract

In many atmospheric and earth sciences, it is of interest to identify dominant spatial patterns of variation based on data observed at p locations with n repeated measurements. While principal component analysis (PCA) is commonly applied to find the patterns, the eigenimages produced from PCA may be noisy or exhibit patterns that are not physically meaningful when p is large relative to n. To obtain more precise estimates of eigenimages (eigenfunctions), we propose a regularization approach incorporating smoothness and sparseness of eigenfunctions, while accounting for their orthogonality. Our method allows data taken at irregularly spaced or sparse locations. In addition, the resulting optimization problem can be solved using the alternating direction method of multipliers, which is computationally fast, easy to implement, and applicable to a large spatial dataset. Furthermore, the estimated eigenfunctions provide a natural basis for representing the underlying spatial process in a spatial random-effects model, from which spatial covariance function estimation and spatial prediction can be efficiently performed using a regularized fixed-rank kriging method. Finally, the effectiveness of the proposed method is demonstrated by several numerical examples.

Article ID: iCSA2015Jul_40032

Title: Application of Volatility in Portfolio Construction

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Abstract

We studied the CBOE Market Volatility Index from 1995 to 2004 and the Cross-Sectional Volatility of MSCI US and MSCI AC Asia ex Japan of the same period. Tracking Error calculations and Market Volatility Analyses were performed. We sel ëcted a portfolio, Dragon, for Risk Analysis, Risk De-composition and Risk Characteristics identification purposes. A conclusion relating Dragon's Tracking Error and its Portfolio Size was drawn.

Article ID: iCSA2015Jul_40033

Title: Optimal Weights in Nonparametric Analysis of Clustered ROC Curve Data

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Abstract

In diagnostic trials, clustered data are obtained when several subunits of the same patient are observed. Within-cluster correlations need to be taken into account when analyzing such clustered data. A nonparametric method has been proposed by Obuchowski(1997) to estimate the Receiver Operating Characteristic curve area (AUC) for such clustered data. However, her estimate gives equal weight to all pairwise rankings within and between cluster. In this paper, we modify Obuchowski's estimate by allowing

weights for the pairwise rankings vary across clusters. We consider the optimal weights for estimating one AUC as well as two AUCs'

difference. Our results in this paper show that the optimal weights depends on not only the within-patient correlation but also the proportion of patients that have both unaffected and affected units. More importantly, we show that the loss of efficiency using equal weight instead of our optimal weights can be severe when there is a large within-cluster correlation and the proportion of patients that

have both unaffected and affected units is small.

Article ID: iCSA2015Jul_40000

Title: Statistical Analysis of Hydrological Water Budget Parameters and Run-Off Behaviour in The Light of Climate Change in The Low Mountain Ranges in Central Germany

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Abstract

The twinning research catchments Schäfertal and Waldbach are located within the catchment area of the upper Selke River in the lower Harz Mountains, Central Germany and are operated by the University of Applied Sciences Magdeburg-Stendal. The Schäfertal catchment is mainly agriculturally used and has an area of 1.44 km^2. In contrast, the Waldbach catchment is covered with forest. The catchment area is 0.35 km^2. The outlets of these catchments are at elevations of 396 and 408 m a.s.l. respectively

The set up of the hydrological research catchments areas Schäfertal and Waldbach has been started in 1965/66 as a contribution to the International Hydrological Decade (1965-74). In 1968 the main hydro-meteorological stations in both catchments were put into operation. During the years 1973 and 2005 numerous additional measuring equipment, above all groundwater monitoring wells, were established and thus, the measurement network was intensified all in all to 71 wells nowadays. Measurements of soil moisture, estimation of water quality parameters and also water sampling for sediment yield and nutrient loads encompass the measurement program.

A trend analysis of the runoff time series and all of the water budget parameters during the period 1968 until 2012 will be presented. The aim of these investigations is to identify the influence of different effects of anthropogenic and natural events on the water budget and the run-off behaviour of these catchments. Isochronal a change of the short term reaction of the catchment on rain inputs can be observed. This all can be identified using a combination of statistical and geostatistical methods. These statistical findings will be utilised to improve the conceptual understanding of the catchment reaction and form the basis for the identification of further trends. A statistical model of the recession behaviour of the yearly summer discharges of the brook Schäferbach over the time series of 12 years was created successfully.

Article ID: iCSA2015Jul_40027

Title: A Goodness-of-Fit Test of Multinomial Logistic Regression Model in Case-Control Studies

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Abstract

For multinomial response in case-control studies, the multinomial logistic regression model is popularly used to infer the relationship between disease and risk factors. After reparameterisation, the assumed multinomial logistic regression model is equivalent to several two-sample semiparametric models in which the log ratio of case to control density function is linear in data. Based on this finding, the semiparametric maximum likelihood estimator is constructed. In order to examine the goodness-of-fit of the multinomial logistic regression model, this study generalizes the idea of Chen and Wang (2013) to propose a moment-type test statistic for the multinomial logistic case-control data. A bootstrap procedure is presented to evaluate the p-value of the proposed test. Power and size comparisons are performed through some simulations. An illustration with two real datasets is provided as well.

Article ID: iCSA2015Jul_40020
Title: A Sequential Logistic Regression Classifier Based on Mixed Effects with Applications to Longitudinal Data
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Abstract
Making an early classification in longitudinal data is highly desirable. For this purpose, we propose a sequential classifier by adopting a neutral zone classifier framework. Our classification procedure evaluates each subject sequentially at each longitudinal time point. If there is not adequate confidence in making a classification at a given time point, the decision will wait until the next time point where another measurement is collected. This process continues until there is enough confidence of making a classification or until the last time point where data can be collected is reached. We demonstrate that our proposed sequential classifier maintains competitive error rates while reducing the overall cost when the cost of time is taken into account. We apply our classifier to a real example of identifying patients that are vulnerable to kidney dysfunction on the basis of up to 7 blood draws sequentially taken from each patient.

Article ID: iCSA2015Jul_40021
Title: Discriminating Between Weibull and Gamma Distributions
Name: Orawan Supapueng, K. Budsaba, A. Volodin,P. Nilkorn
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Abstract
Gamma and Weibull are the most popular distributions in analyzing skewed lifetime data. They have many similar properties. Nevertheless they have some different properties, especially when the lifetime data analysis emphasizes the survival function. We can observe that it will be more efficient if we can select the correct distribution for a given data right from the beginning of the Statistical Analysis. Therefore in this article, we investigate the asymptotic method for distinguishing between these two distributions. It is observed that the asymptotic distribution is independent of a nuisance parameter. We perform some numerical simulations to observe that the asymptotic method performs well for different sample sizes.

Article ID: iCSA2015Jul_40022
Title: A New Integrated Fuzzifier Evaluation and Selection (NIFEs) Algorithm for Fuzzy Clustering
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Abstract

Fuzzy C-means (FCM) is simple and widely used for complex data pattern recognition and image analyses. However, selëcting an appropriate fuzzifier (m) is crucial in identifying an optimal number of patterns and achieving higher clustering accuracy, which few studies investigated. Built upon two existing methods on se-lecting fuzzifier, we developed an integrated fuzzifier evaluation and selëction algorithm and tested it using real datasets. Our findings indicate that the consistent optimal number of clusters can be learnt from testing different fuzzifiers for each dataset and the fuzzifier with the lowest value for this consistency should be selëcted for clustering. Our evaluation also shows that the fuzzifier impacts the clustering accuracy. For longitudinal data with missing values, m =2 could be an empirical rule to start fuzzy clustering, and the best clustering accuracy was achieved for tested data, especially using our multiple-imputation based fuzzy clustering.

Article ID: CODEDS2015Jul_40008

Title: Stability Analysis of the ODE Model Representation of Amyloidogenic Processing in Alzheimer& Disease in the Presence of SORLA

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Abstract

Central to the pathology of Alzheimer's Disease (AD) is the proteolytic processing of amyloid precursor protein (APP) into amyloid plaques. SORLA (sorting protein-related receptor with A-type repeats) has a major influence in such process as it alters the form of the substrate APP that is preferredby the enzymes α- and β- secretases, therefore inhibiting the amyloidogenic processing. This paper analyzed the temporal behavior of the solutions of the system of 20 ordinary differential equations (ODE) that models the bio-chemical system describing APP processing under the influence of SORLA, by performing a stability analysis of the ODE model.

The number of equations in the model was reduced to 9 by considering only the coupled equations in the system and by imposing initial conditions on the system. Only one biochemically meaningful equilibrium point ξ was computed. By means of linearization, Hartman-Grobman Theorem, and Routh-Hurwitz Test, it was shown that ξ is a locally asymptotically stable equilibrium point. The region of attraction of ξ was approximated by using the Fluctuation Lemma. Immediate consequence of the stability analysis of the reduced system to the solutions of the original system was also determined.

Article ID: CODEDS2015Jul_40015
Title: Population Models with Quasi-Constant-Yield Harvest Rates

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Abstract

This presentation is based on recent joint work on one-dimensional logistic population models with quasi-constant-yield harvest rates. I shall derive a one-dimensional diffusive logistic population model with a quasi-constant-yield harvest rate function under the usual assumptions that a population inhabits a patch of dimensionless width and no members of the population can survive outside of the patch. We shall tackle the essential problem: determining the size of the patch and harvestable quantity of the species without having the population die out. We shall give explicit and computable expressions for the upper bounds of the norms of the harvesting rate functions, which can be applied to determine the harvestable quantity of the species.

Technical Session 8: Mathematics Ⅲ

Article ID: ICPDE2015Jul_40001
Title: Category of Attractor and its Application
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Abstract
In this paper, we provide a new approach to study the geometry of attractor. By applying category, we investigate the relationship between attractor and its attraction basin. In a complete metric space, we prove that the categories of attractor and its attraction basin are always equal. Then we apply this result to both autonomous and non-autonomous systems, and obtain a number of corresponding results.

Article ID: ICPDE2015Jul_40002
Title: Pullback Exponential Attractors for Nonau-Tonomous Reaction Diffusion Equations
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Affiliation: Lanzhou City University
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Abstract
Under the assumption that g(t)is translation bounded, and using the method developed in [3], we prove the existence of pullback exponential attracotrs for nonli-near reaction diffusion equation with polynomial growth nonlinearity.

Article ID: ICPDE2015Jul_40003
Title: On No-Node Solutions of The Lazer-Mckenna Suspension Bridge Models
Name: Fanglei Wang
Affiliation: College of Science, Hohai University
E-mail: wang-fanglei@hotmail.com

Abstract

In this paper, we are concerned with the existence and multiplicity of no-node solutions of the Lazer-McKenna suspension bridge models by using the fixed point theorem in a cone.

Article ID: ICPDE2015Jul_40008
Title: Solving Nonlinear Elliptic Boundary Value Problems using Time Integration and Approximate Fundamental Solutions
Name: Haiyan Tian
Affiliation: The University of Southern Mississippi
E-mail: haiyan.tian@usm.edu

Abstract
Through a fictitious time approach, a nonlinear elliptic boundary value problem is converted to a time-dependent quasilinear problem. This is further approximated by a sequence of time-dependent linear nonhomogeneous modified Helmholtz boundary value problems, which are solved by the method of particular solutions of Delta-shaped basis functions and approximate fundamental solutions. Numerical results support the accuracy and validity of the computational method.

Article ID: ICPDE2015Jul_40011
Title: New Mmodel for L2 Norm Flow
Name: Jiaojiao Li
Affiliation: Henan Normal University
E-mail: lijiaojiao8219@163.com

Abstract
We introduce a new L^2 norm preserving heat flow in matrix geometry. We show that the flow exists globally and preserves the positivity property of Hermitian matrices.

Article ID: ICPSA2015Jul_40001

Title: Localization of Unbounded Operators on Guichardet Spaces

Name: Jihong Zhang

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E-mail: zhjhzhangjihong@163.com

Abstract

As stochastic gradient and Skorohod integral operators, (∇, δ) is an adjoint pair of unbounded operators on Guichardet Spaces $\mathcal{F}$. In this paper, we define an adjoint pair of operator (ℓ_s, ℓ_s^*), where $\ell_s = \nabla sE_s[C]$ with $E_s[C]$ being the conditional expectation (operator). We show that ℓ_s (resp. ℓ_s^*) is essentially a kind of localization of the stochastic gradient operators (resp. Skorohod integral operators δ). We examine that ℓ_s and ℓ_s^* satisfy a local CAR (canonical anti-communication relation) and $(\ell_s^*)_s \geqslant 0$ forms a mutually orthogonal operator sequence although each ℓ_s is not a projection operator. We find that ℓ_s is s-adapted operator if and only if rs is ∇s is s-adapted operator. Finally we show application exponential vector formulation of QS calculus.

Article ID: ICPSA2015Jul_40007

Title: A Strong Law of Large Numbers for Set-Valued Random Variables in Gα Space

Name: Li Guan

Affiliation: College of Applied Sciences,Beijing University of Technology

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Abstract

In this paper, we shall represent a strong law of large numbers (SLLN) for weighted sums of set-valued random variables in the sense of the Hausdorff metric d_H, based on the result of single-valued random variable obtained by Taylor [11].

Article ID: ICPSA2015Jul_40008

Title: The Extinction Time in Two-Sex Branching Processes in Varying Environments

Name: Alfonso Ramos

Affiliation: University of Extremadura

E-mail: aramos@unex.es

Abstract

The bisexual Galton-Waston process in varying environments was introduced in Molina et al. (2003) as a two-type sequence $\{(F_n, M_n)\}_{n=1}^{\infty}$ defined in the form:

$$(F_{n+1}, M_{n+1}) = \sum_{i=1}^{Z_n} (f_{ni}, m_{ni}), Z_{n+1}$$

$$= L(F_{N+1}, M_{N+1}), n = 0, 1, \ldots \qquad (1)$$

where the empty sum is considered to be (0,0), $Z_0 = Z \in \mathbb{Z}^+$ and, for every $n=0,1,\ldots$, $\{(f_{ni}, m_{ni})\}_{i=1}^{\infty}$, is a sequence of i.i.d. non negative integer valued random variables, being $\{p_{jk}^{(n)}\}_{j,k=0}^{\infty}$, the offspring probability distribution corresponding to the n-th generation, namely $p_{jk}^{(n)} := P(f_{n1} = j, m_{n1} = k), n = 0, 1, \ldots$.

In this work we consider the superadditive inhomogeneous two-sex branching process and investigate the extinction time of the process and

some necessary and sufficient conditions for the almost sure extinction of the process.

Article ID: ICPSA2015Jul_40015
Title: Extremal Limit Theorems for Heavy Tailed Processes
Name: Istvan Berkes
Affiliation: Graz University of Technology
E-mail: berkes@tugraz.at

Abstract
Extreme value theory goes back to the 1920's and most basic problems in the i.i.d. case have been settled completely. The situation is much less satisfactory in the dependent case, even though many important problems of probability and analysis lead to extremal problems for dependent processes. In our talk we discuss some new results in the i.i.d. case such as limit theorems for the St. Petersburg game and some unusual results in the theory of modulus trimming. We also discuss applications in analysis, such as extremal results for continued fractions.

Article ID: ICPDE2015Jul_40005
Title: Stable Stable Solitons in A Generalized Coupled Cubic Quintic Ginzburg-Landau Equations
Name: Emmanuel Yomba
Affiliation: California State University-Northridge
E-mail: emmanuel.yomba@csun.edu

Abstract
Via the use of Hirota method, bright-bright, dark-dark and front-front solutions of a generalized coupled CQGLEs are obtained and analyzed. The Stability of these solitons are fully discussed both analytically using linear stability analysis and the Noether's theorem and numerically using a split-step finite difference method. Except to the front soliton, the bright, the dark solitons propagate in a stable way under effect of 10% white noise.

Article ID: iCSA2015Jul_40034
Title: Nonlinear Behavior of Plasma: Connection with Nonextensive Statistics
Name: Hui-Bin Qiu
Affiliation: Beijing University of Technology
E-mail: qiuhuibin1@163.com

Abstract
Nonextensive hydrodynamic equations and Zakharov equations are derived by moment equation and two time-scale methods, respectively. The conservation quantities and nonlinear entity collapse scalar law are obtained, from which we find that the conservation energy is relevant to the nonextensive parameter but momentum as well as angular momentum and the number of plasmon are not affected by the nonextensivity of system. The self-similar collapse solution of nonextensive Zakharov equations is also presented. Furthermore, we demonstrate that the nonlinear entity collapse scalar law is relevant to the nonextensive parameter and especially it allows the existence of three dimensional stable and one dimensional collapse nonlinear entity, which is significantly different from the case of Maxwellian distribution. In the extensive limit, all the results obtained in the framework of
Maxwellian are reproduced.

Article ID: ICFA2015Jul_40008
Title: Well-Posedness of Gaver`s Parallel System Attended by a Cold Standby Unit and a Re-pairman with Multiple Vacations
Name: Abdukerim Haji
Affiliation: College of Mathematics and System Sciences, Xinjiang University
E-mail: abdukerimhaji@sina.com

Abstract
We investigate Gaver`s parallel system attended by a cold standby unit and a repairman with mul-tiple vacations. By using C0-semigroup theory of linear

operators in the functional analysis, we prove well-posedness and the existence of the unique positive dynamic solution of the system.

Article ID: ICFA2015Jul_40009

Title: On Existence of Best Proximity Points And Application to Differential Equations

Name: G Sankara Raju
Affiliation: Institute Institute of Technology of Ropar, Inida
E-mail: raju@iitrpr.ac.in

Abstract

Let (A,B) be pair of subsets in a metric space. Fixed point theorems for an operator $T: A \to B$ are to investigate a point x_0 (called as a fixed point for the operator T), if the operator equation Tx=x posses a solution at x_0. If the fixed pointg equuation Tx=x does not posses any solution. Then it is the natural interest to find optimal solution for d(x, Tx). In this stand point we prove the existence of a point x in A such that d(x, Tx)=dist(A,B):={d(u,v):u∈A, v∈B} (such a point is said to be best proximity point) for a map T:A∪B→A∪B satisfying T(A) ⊆B and T(B)⊆A.

Results involving best proximity pair theorems (best proximity points) and their applications have been studied by many authors in different directions. We also prove that for any x_0 in A the sequences $\{T^{2n}x_0\}$ and $\{T^{2n+1}x_0\}$ converge to x and Tx respectively. As an application, we consider the system of differential equations $y' = f(x, y), y(x_0) = y_0$ and $z' = g(x, z), z(x_0) = z_0$. We prove that the existence of solutions $\emptyset$ and φ (continuous functions on a neighborhood of x_0) for the above system with $\|\emptyset - \varphi\| = |y_0 - z_0|$ (which is the optimum distance).

Article ID: ICPDE2015Jul_40016

Title: Blow-up of Solution to Cauchy Problem for the Singularly Perturbed Sixth-Order Boussinesq-Type Equation

Name: Song Changming
Affiliation: College of Science, Zhongyuan University of Technology, Zhengzhou,China
E-mail: cmsongh@163.com

Abstract

We consider the singularly perturbed sixth-order Boussinesq-type equation,which describes the bidirectional propagation of small amplitude and long capillary gravity waves on the surface of shallow water for bond number (surface tension parameter) less than but very close to 1/3.The sufficient conditions of blow-up of solution to the Cauchy problem for this equation are given.

Part V   Instructions for Presentations

Oral Presentation

Devices Provided by the Conference Organizing Committee:

- Laptops (with MS-office & Adobe Reader)
- Projectors & Screen
- Laser Sticks

Materials Provided by the Presenters:

- PowerPoint or PDF files

Duration of each Presentation:

- Regular Oral Session: 10-15 Minutes of Presentation
- Plenary Speech: 40-45 Minutes of Presentation

Part VI   Hotel Information

About Hotel

Guangdong Hotel (Shanghai) is located on Yi Xian Road, DaBaiShu industry & trading center in Shanghai, adjacent to the prestigious universities, such as Fudan, Tongji and Shanghai international studies university. DaBaiShu area is one of the 12 commercial zones in Shanghai, where conveniently linked by track line 3 and inner elevated ring road. Its 15 minutes ride to the Bund and Downtown area.

Address: 328 Yixian Road, Hongkou District, Shanghai
Contact Number: 86-21-55589888
Fax Number: 86-21-55512808
Webiste: http://www.shgdh.com/en

For non-Chinese author, please show the following info to the driver if you take a taxi:
请送我到：中国上海市虹口区逸仙路328号 上海楚天粤海大酒店

Contact Us

Organizing Committee

Secretary: Ms. Becky

Telephone: +86 13264702250

A Flexible quasi-solid-state Electrochromic Device with Polymeric Electrolyte and WO$_3$/NiO Complementary System

2015 International Conference on Materials Processing Technology (MPT 2015)

Jen-Yuan Wang[*], Min-Chuan Wang, Der-Jun Jan

Physics Division, Institute of Nuclear Energy Research, Taoyuan 325, Taiwan
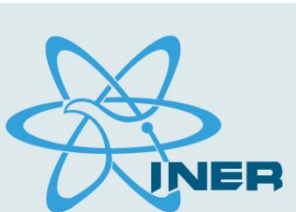
INER Institute of Nuclear Energy Research
Atomic Energy Council, Executive Yuan

Introduction: Electrochromic device (ECD)

Chromic →color change

Ex.1 Tungsten oxide (H_xWO_3)
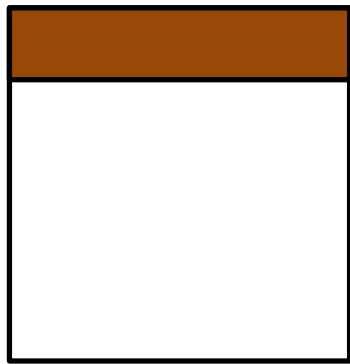
Oxidation, transparent

Reduction , blue color

Electrochromic Device (sandwich structure)

| TCO |
| Electrochromic electrode |
| Electrolyte |
| Electrochromic electrode |
| TCO |
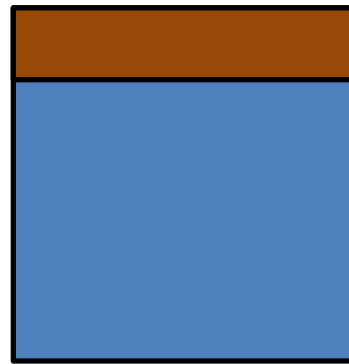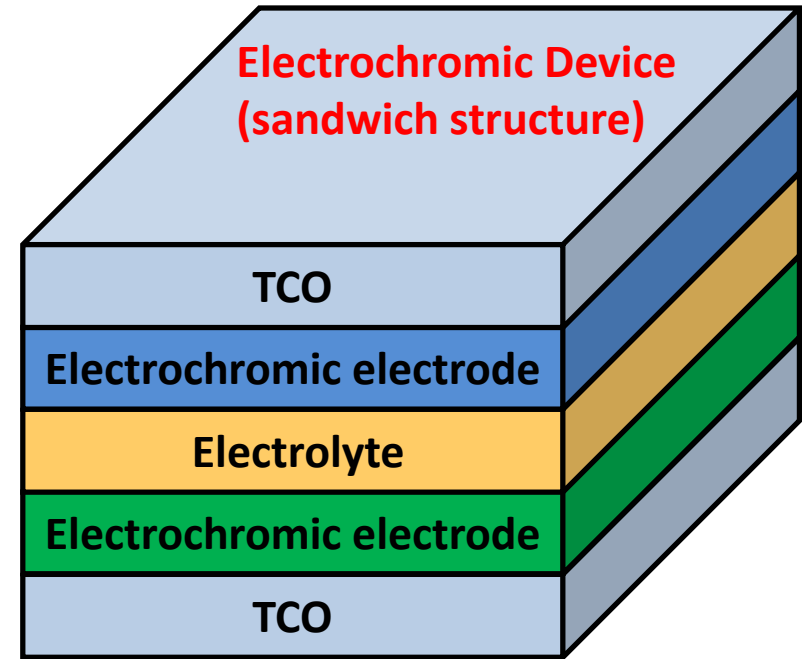
Ex.2 Polyaniline
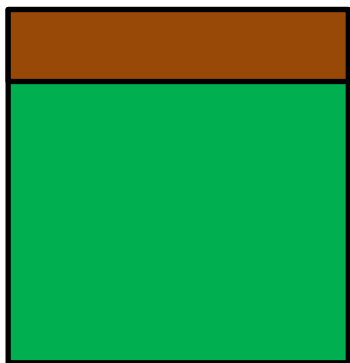
Oxidation, green

Reduction , transparent

http://marketplace.yet2.com/app/insight/techofweek/38644
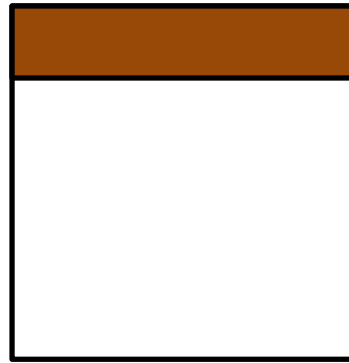
TCO: transparent conducting oxide layer

Application of polymer electrolyte: EC smart windows
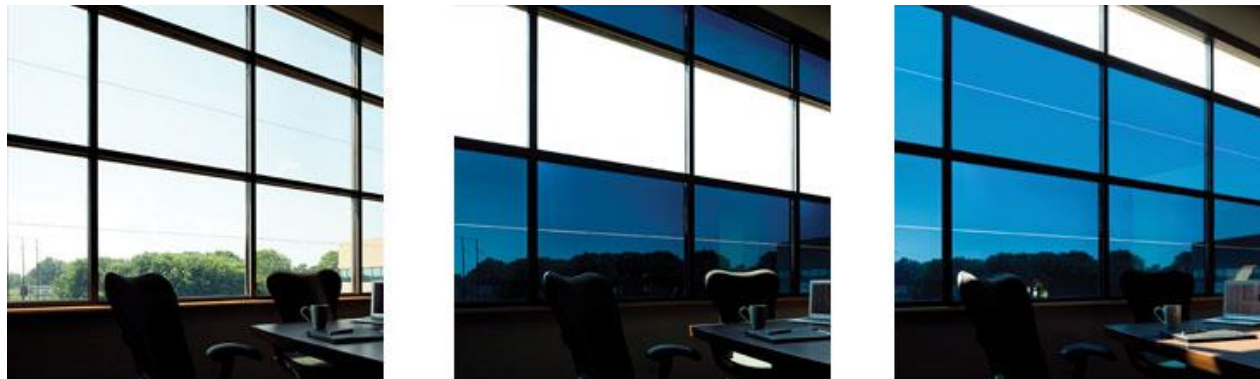
Electrochromic windows (SageGlass)

The first electrochromic window in the world (seats on Poeing 787 Dreamliner)

http://sageglass.com/sageglass/control-system/

Non-mechanical variable apertures

20 mm

J. Opt. 16 (2014) 075301

Institute of Nuclear Energy Research
Atomic Energy Council, Executive Yuan

2
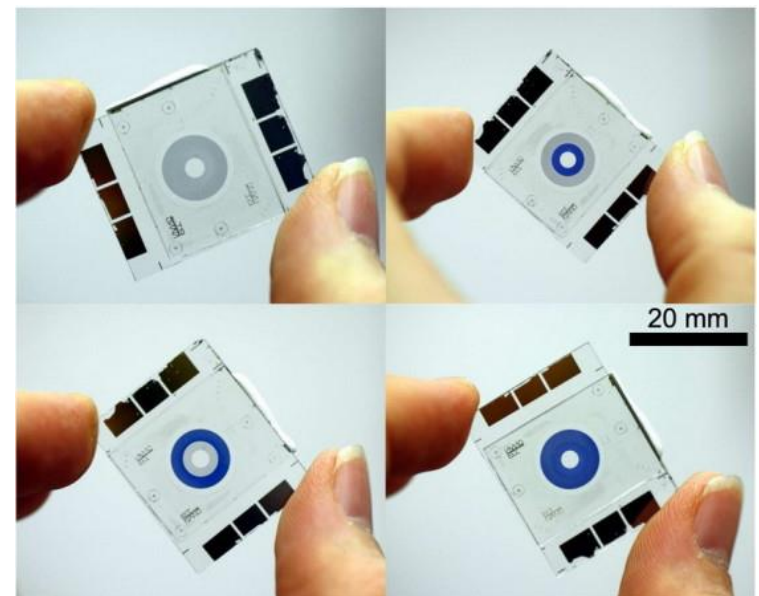
Electrochromic Device based on WO_3/NiO Complementary System

ITO/glass

WO_3 layer

Polymeric electrolyte

NiO layer

ITO/glass
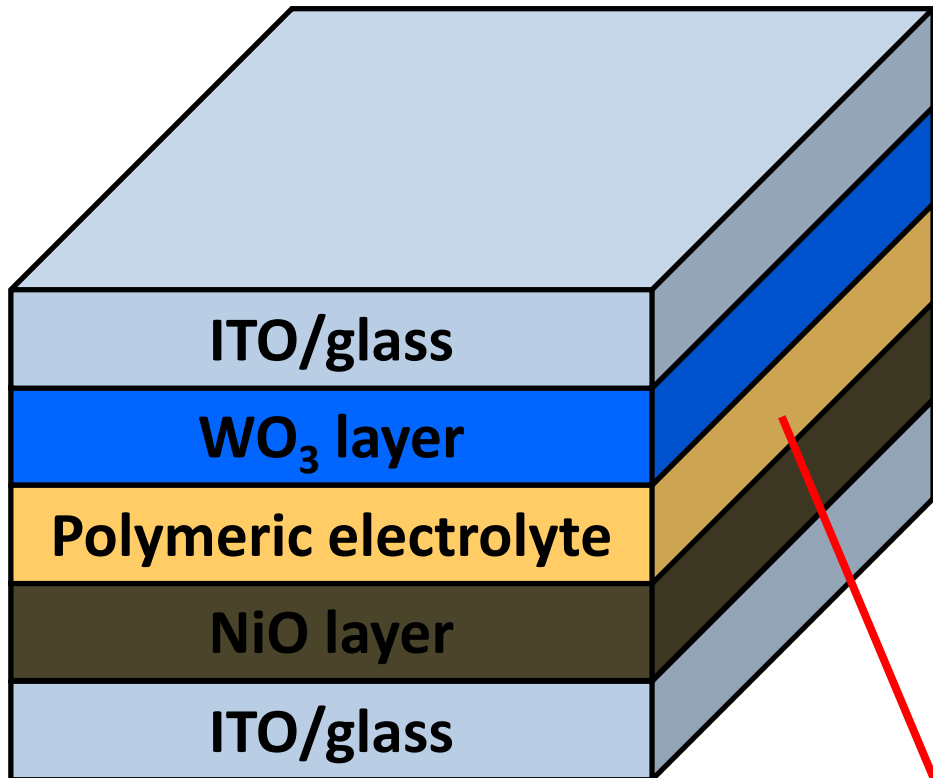
Homemade ITO/WO_3 and ITO/NiO EC electrode prepared by sputtering
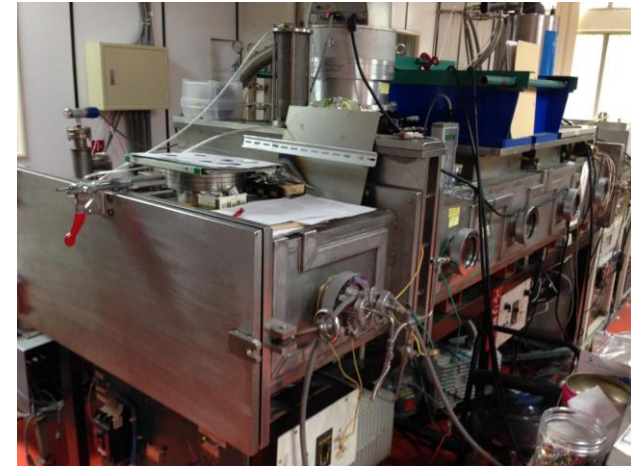
In-Line Sputtering System

Electrolyte monomer: ETPTA/PC (15:85) + 1 M $LiClO_4$ + 0.1 mL HMPP + 0.1 mM Fc
UV-curing time: 50 s
*ETPTA: ethoxylated trimethylolpropane triacrylate

The ionic conductivity of the polymeric electrolyte
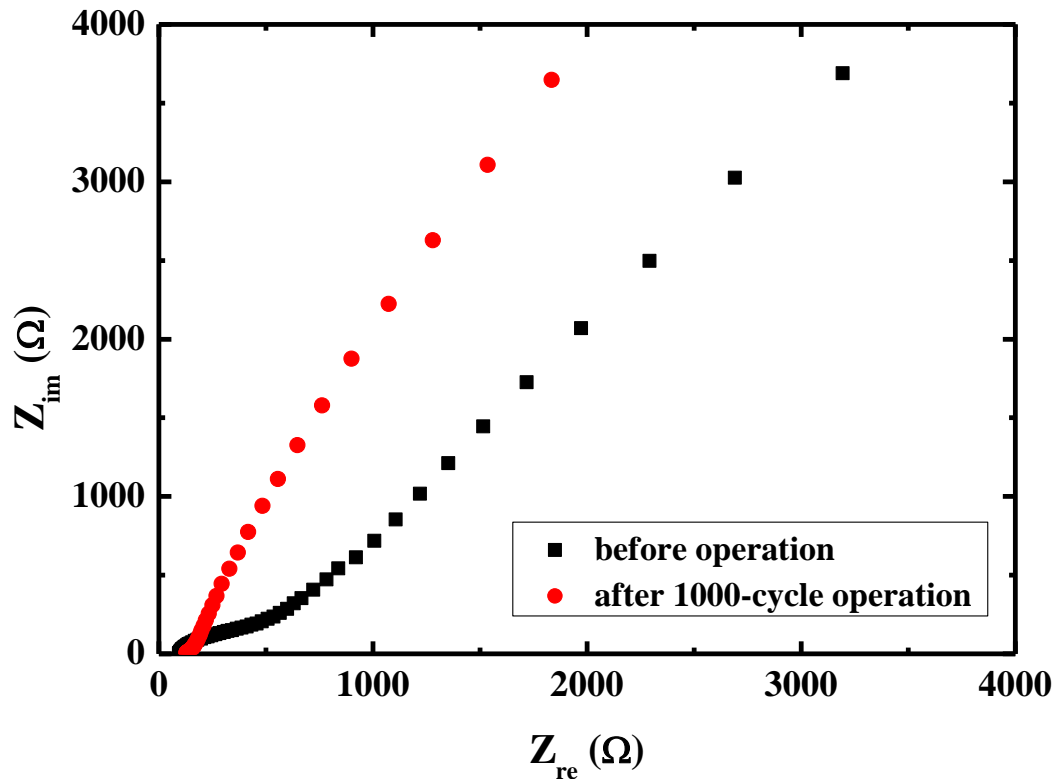
$$\sigma = \frac{l}{R_b A}$$

l: the thickness of the solid electrolyte
   membrane (150 μm)

A: the contact area between the electrode and the electrolyte (2x3 cm^2)

R_b: the ionic resistance (1/3 R_{ct}, 1260 Ω)

σ_{ion} = 5.6 x 10^{-5} S/cm
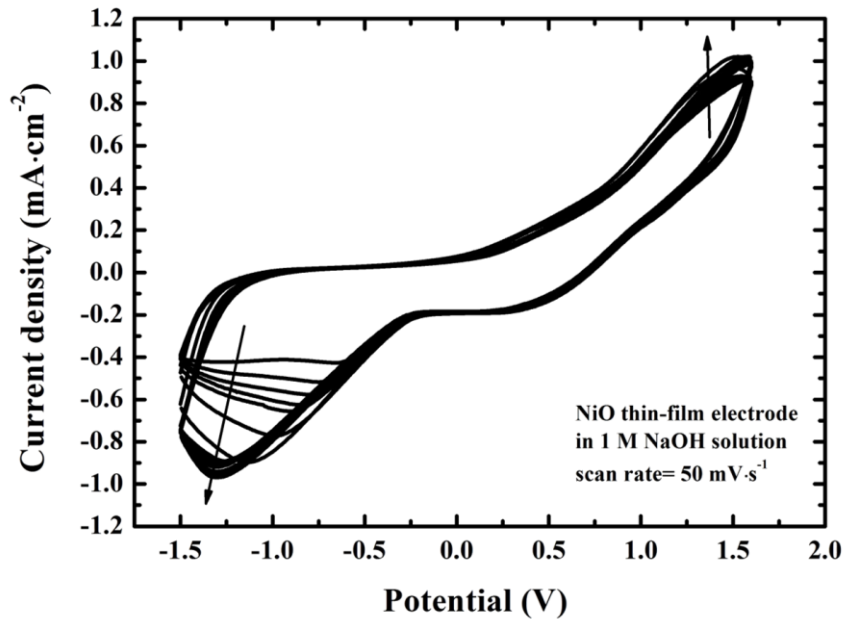
Legend in chart:
- ■ before operation
- ● after 1000-cycle operation

☐ After activation, the polymeric electrolyte performs good ionic conductivity (5.6 x 10^{-5} S/cm)

The electrochemical properties of WO₃ thin film electrode

$$WO_3(\boldsymbol{transparent}) + xLi^+ + xe^- \leftrightarrow Li_xWO_3(\textcolor{blue}{\boldsymbol{blue}})$$
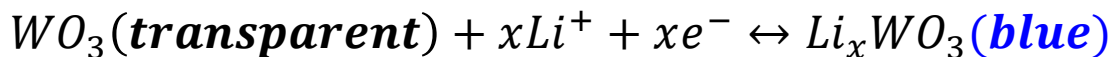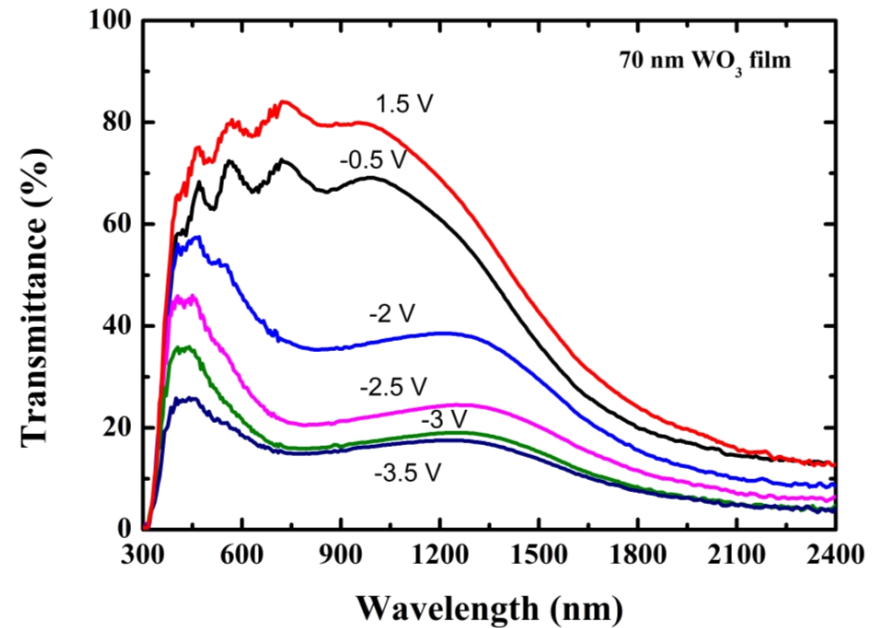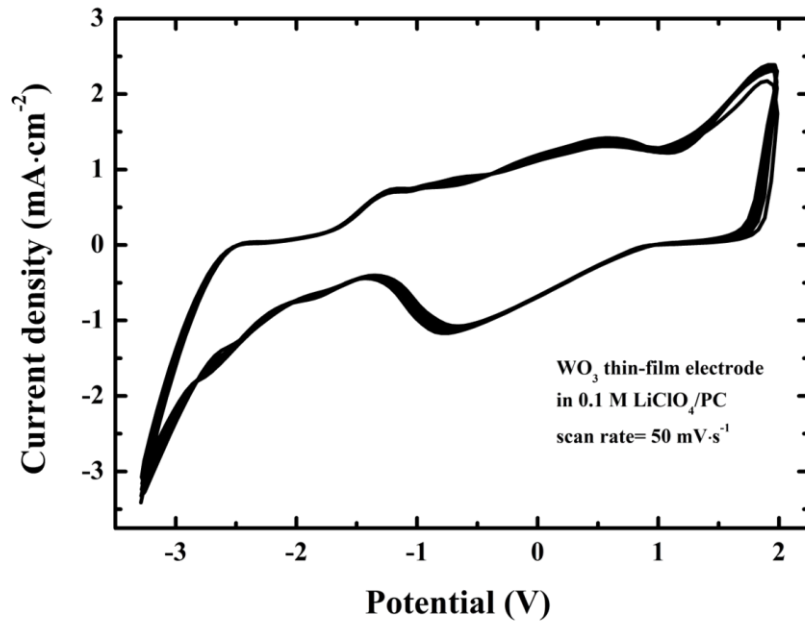
- ☐ During the 100-cycle pretreatment, the current density of the electrode became stable
- ☐ The equilibrium of the ion insertion and extraction was achieved
- ☐ The transmittances at 550 nm of the fully bleached and colored state of the WO₃ thin film were 76% (at 1.5 V) and 20% (at -3.5 V)

# The electrochemical properties of NiO thin film electrode

$$NiO + OH^- \rightarrow Ni(OH)_2 \quad \text{(Pretreatment)}$$
$$Ni(OH)_2 + OH^- \leftrightarrow NiOOH + H_2O + e^-$$
(transparent)　　　　(dark brown)
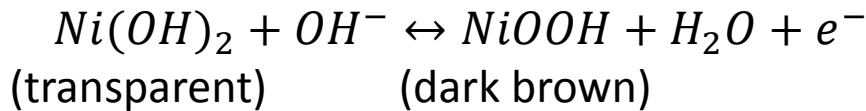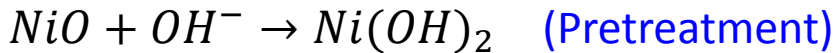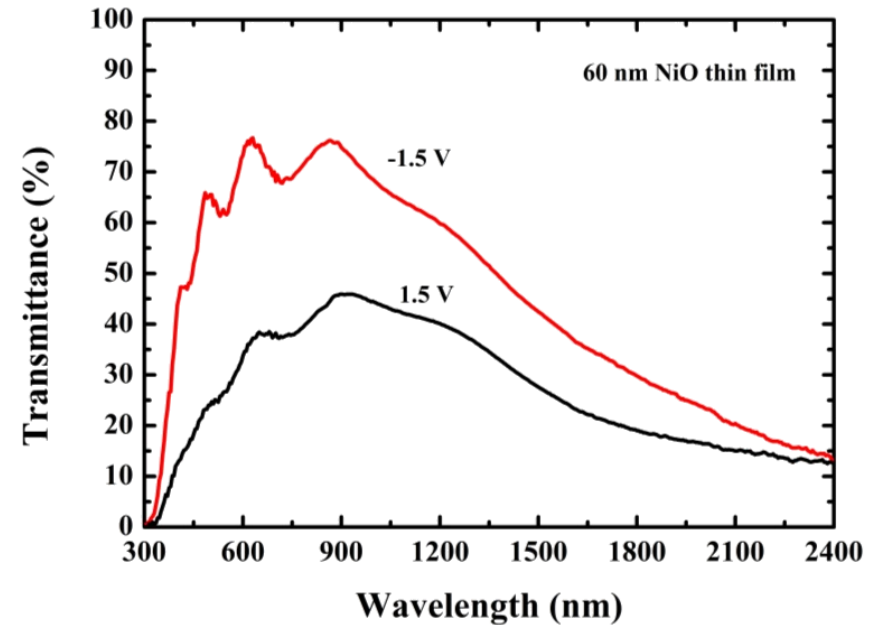
- ☐ The transmittances at 600 nm of the fully bleached and colored state of the NiO thin film were 75% (at -1.5 V) and 45% (at 1.5 V).
- ☐ The largest transmittance difference was 38% at 600 nm.

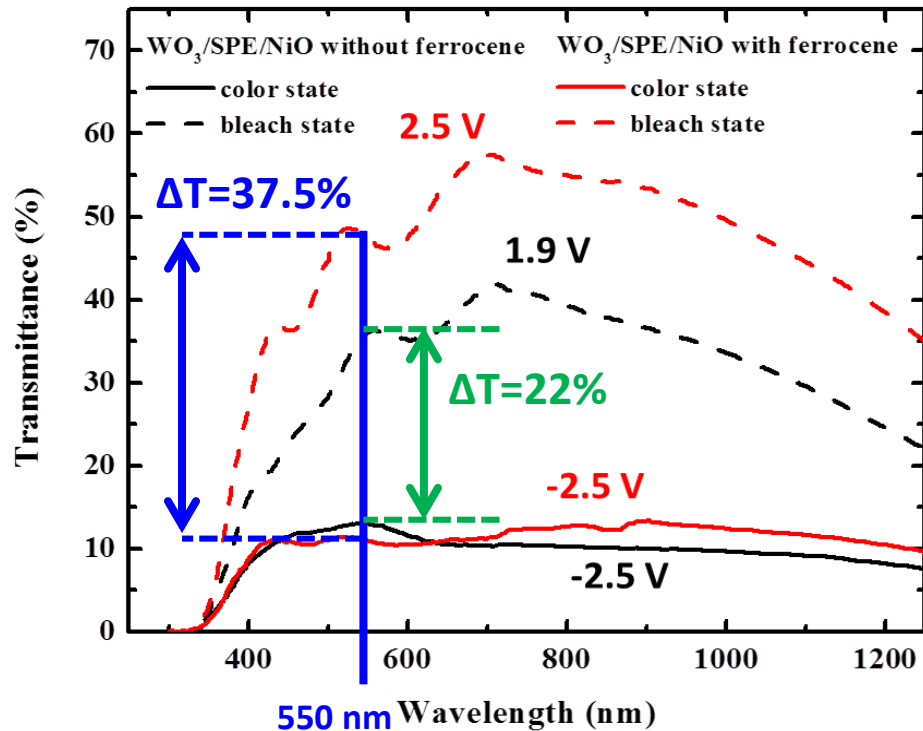# The electrochemical properties of the ECD

-2.5 V

2.5 V
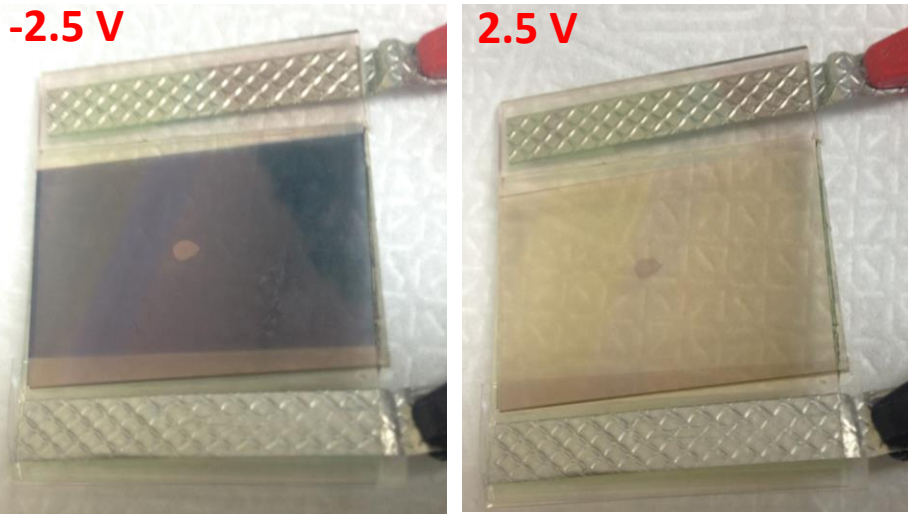
The pictures of the ECD with different applied voltages.
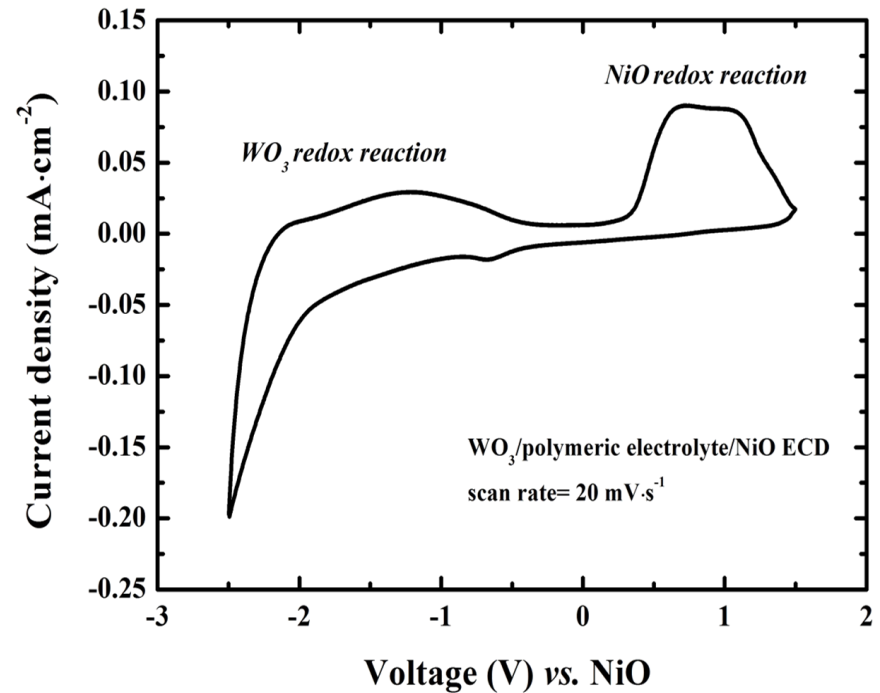
☐ The redox reaction at the voltage between -2.5 and 0 V is contributed by the WO_3.

☐ The other redox pair is related to the NiO redox reaction

The performance of the ECD

- ☐ Two ECDs were investigated in this experiment to realize the effect of redox mediator (ferrocene) in the polymeric electrolyte.

- ☐ For the ECD without ferrocene, the colored state and bleached state were at -2.5 and 1.9 V. The transmittance attenuation (ΔT) at 550 nm was 22%.

- ☐ For the ECD with ferrocene in the electrolyte, the ΔT was 37.5%, which was 15.5% higher than that of the ECD without ferrocene. This was because that the introduction of ferrocene changed the safe operation voltage window of the ECD.

Summary

- In summary, an ECD based on WO_3, NiO and a qusai-soild-state polymeric electrolyte has been demonstrated.
- The device exhibited blue-yellowish electrochromism and could be reversibly switched.
- After adding ferrocene into the electrolyte, the safe operation voltage window was extended, and the electrochemical and optical properties of the ECD were also improved. The ΔT at 550 nm of the ECD was 37.5%, which was 15.5% higher than that of the ECD without ferrocene.
- The qusai-soild-state polymeric electrolyte benefits the future application in electrochromic products.

ECD glasses prototype

8 x 8 cm² PET-based ECD

9

Acknowledgement

Thank the committee of 2015 International Conference on Materials Processing Technology (MPT 2015) for holding this conference.

Thank you for your attention!!