出國報告（出國類別：其他）

赴美國參加 AIMCAL 2012 國際研討會國外公差報告

服務機關：核能研究所
姓名職稱：黃至鵬　副研發師
派赴國家：美國
出國期間：101 年 10 月 19 日~101 年 10 月 27 日
報告日期：101 年 11 月 27 日

摘　要

金屬鍍膜塗佈及夾層行業協會(Association of International Metallizers, Coaters and Laminators, AIMCAL) 舉辦的 2012 Web Coating & Handling 國際研討會為歷年來所辦規模最大、參與人數最多的國際重要捲揚式設備會議，每年定期舉辦一次，邀請來自世界各地的相關領域傑出的研究者及工業界人士出席，所發表之論文與論壇皆為目前世界上最新技術及應用發展為主，本人有幸受邀於會中口頭發表研發成果論文，並搜集業界相關捲揚式電漿鍍膜技術暨設備應用於產業之最新資訊，進而瞭解國外研發現況、市場及未來發展方向。

本所正在發展可撓式(flexible)基板之捲揚式電漿鍍膜設備研發可撓式類紙化產品，包含捲揚式大面積化均勻鍍膜及製程技術，本次研討會對於實現捲揚式製程可行性方面之相關研發技術研發的藍圖上具有極高的一致性，將有助於規劃本所未來發展方向。

目　　次

摘 要..... i

目 次..... ii

一、目 的..... 1

二、過 程..... 1

三、心 得..... 4

四、建 議 事 項 24

五、附 件

附件一：AIMCAL 2012國際研討會議程..... 25

附件二：AIMCAL 2012國際研討會議參加人員名單..... 30

一、 目的

美國金屬鍍膜塗佈及夾層行業協會(Association of International Metallizers, Coaters and Laminators, AIMCAL) 舉辦的 2012 Web Coating & Handling 國際研討會為歷年來所辦規模最大、參與人數最多的國際捲揚式設備會議，每年定期舉辦一次，邀請來自世界各地的相關領域傑出的研究者及工業界人士出席，所發表之論文與論壇皆以目前世界上最新技術及應用發展為主，研討主題包括(1) 捲揚式鍍膜塗佈及夾層（Web Coating & Laminating） (2) 捲揚式真空鍍膜（Vacuum Web Coating） (3) 捲揚式運布（Web Handling）。本人有幸受邀於會中口頭發表研發成果論文，希望藉由參與研討會能與相關領域傑出的專家彼此交流，以獲得更多可撓式製程技術資訊及相關發展方向。

目前產業新興的趨勢為電子產品整合太陽能電池(Product Integrated PV、PIPV)及建築物整合太陽能電池 (Building integrated PV、BIPV)，捲揚式電漿鍍膜設備研發可撓式輕薄的太陽電池模組預期將會加速其應用之發展。藉由本組研發捲揚式節能薄膜元件及設備論文於國際會議的發表，以提升本所之國際能見度，並搜集業界捲揚式薄膜製程設備及技術開發最新研究資訊，以瞭解國外研發現況、市場及未來發展方向。

二、 過程

此次國外公差共計 9 天，由 101 年 10 月 19 日至 10 月 27 日。從台灣出發並未有直接的航程到目的地模特爾比奇市，故本人於 101 年 10 月 19 日晚上 11：50 由桃園國際機場搭乘中華航空班機赴美國加州洛杉磯市，經過約三個小時等待後搭乘達美航空班機轉機至喬治亞洲亞特蘭大市，接著再轉機至目的地美國南卡羅萊納州模特爾比奇市，飛機行程去程約 23 小時。此次會議大會主辦單位及旅館方面皆無安排接駁車，故搭計程車至旅館，抵達旅館約為當地時間 10 月 20 日中午 12 點。

10 月 21 日早上開始參加位於模特爾比奇市的飯店（Myrtle Beach Marriott Resort at Grande Dunes，如圖 1 所示）由美國 AIMCAL 協會主辦捲揚式連續電漿鍍層、塗層、覆合與運布國際研討會（AIMCAL USA Web Coating & Handling Conference 2012），本人於會場前合影（如圖 2 所示）。該協會每年固定舉辦兩次會議，分別在美國及歐洲舉行，為全球捲揚式電漿 領域最重要之會議之一。。本次會議邀請了著名的英國約克大學 Yvette Hancock 教授的大會演講展開序幕，講題為『石墨烯的撓曲特性』，演講中提到自 2010 年由英國曼徹斯特大學的 Andre Geim 博士與 Konstantin Novoselov 博士以一種簡單易行製備石墨烯（graphene）的

新方法獲得諾貝爾物理獎之後，石墨烯的研究就吸引了大批科學家的興趣。石墨烯目前是世上最薄且最堅硬的奈米材料，且由於它的電阻率極低，可被用來發展出更薄、導電速度更快的新一代電子元件或電晶體。除此之外，石墨烯尚有許多很好的應用，例如應用在透明觸控螢幕、太陽能電池上…等，Yvette Hancock 教授從石墨烯的發現、特性、製造方式、到相關鍍膜塗佈及夾層上的應用都以深入淺出的方式說明， 能在此吸收到目前最熱門的石墨烯知識可說是受益良多。

10 月 22 日下午 4：30，本人受邀於會中之捲揚式連續電漿鍍層、塗層領域中口頭發表捲揚式電漿鍍膜設備研發成果論文，題目為『Investigation of Gas Gate Isolation with Roll-to-Roll VHF PECVD System』，演講結束後有數名國外學者針對演講內容紛紛提問並表示極大的興趣，顯示本所開發之捲揚式電漿鍍膜設備以達國際上頂尖的水平。

研討會議程共計 4 天，由 101 年 10 月 21 日至 10 月 24 日。會議每天從早上 8 點至 12 點，下午從 1 點至 7 點，於 24 日下午 7 點結束，AIMCAL 2012 國際研討會議程(請見附件一所示)。此次會議有近三百位來自世界各地的知名科學家、學校教授、研發單位、工業代表、公司領導人等，共同來參與本會議以分享所學知識與技術，使本次研討會的場面堪稱空前，其中大多數來自歐美國家，亞洲國家與會者只有六位，本人有幸成為唯一的台灣代表，AIMCAL 2012 國際研討會議參加人員名單（請見附件二所示）。研討會所發表之論文皆為目前最先進的捲揚式連續電漿及材料研發領域，內容相當精彩與豐富，投稿暨發表的論文更接近 100 篇。

會議結束後，本人於當地時間 10 月 25 日晚上 6：59 由模特爾比奇市搭乘達美航空班機赴美國喬治亞州亞特蘭大市，經過約兩個小時等待後轉機至加州洛杉磯市，接著搭乘中華航空班機返回桃園機場國際機場，結束這次 AIMCAL Conference 2012 豐碩之旅。飛機行程返程約 24 小時。

行程及工作日誌大要如下表所示：

日期	行程	公差地點	工作內容
101/10/19（五）	台北→洛杉磯	洛杉磯	去程
101/10/20（六）	洛杉磯→模特爾比奇	模特爾比奇	去程
101/10/21（日） ｜ 101/10/24（三）	模特爾比奇	模特爾比奇	參與 AIMCAL 2012 國際研討會
101/10/25（四）	模特爾比奇→洛杉磯	洛杉磯	返程
101/10/26（五） ｜ 101/10/27（六）	洛杉磯→台北	台北	返程

圖 1、AIMCAL 2012 研討會所在地：Myrtle Beach Marriott Resort at Grande Dunes

圖 2、 AIMCAL 2012 研討會會場

三、 心得

論文發表的議程一共四天，共舉行了數十場演講，顯示捲揚式電漿鍍膜領域已是目前當紅的研究領域，同時亦受到國際上相當大的關注。在參加研討會的過程中除了能感受到了不同文化及不同研究技巧的衝擊之外，在對於未來研究的方向能有著更堅定的信念，的確是段很值得花時間參與的過程。

本次會議另一場大會演講邀請到著名的西雅圖州華盛頓大學 Gerald H. Pollack 教授（如圖 3 所示），講題為『水的奧密：E=H_2O』，演講中提到水是有結構的，如咖啡上的紋路可淺而易見是最好的證明。一般認為水有三相：固相、液相、氣相，但 Pollack 教授發現水的第四相，存在於水的許多層親水面附近，大約有幾百個微米的厚度，稱之為水排斥區（Exclusion-zone water）（如圖 4 所示），其晶格成有序排列，有點類似液晶相。水的第四相不但帶電，可製成電池使用，在各種波長的光照射下如 UV、可見光、近紅外線等皆可產生電流充電，就很像是植物吸收光轉換成能量一般。一般而言，只需利用波長 3.1 微米的光照射五分鐘，即可讓排斥區的寬度增加至少三次以上。這樣的發現不但可廣泛利用太陽能及各種能源，還可以幫助我們理解各種自然界中包含水與介面間能量的傳輸、滲透作用及生命的起源。

圖 3、Gerald H. Pollack 教授演講『水的奧密：E=H_2O』

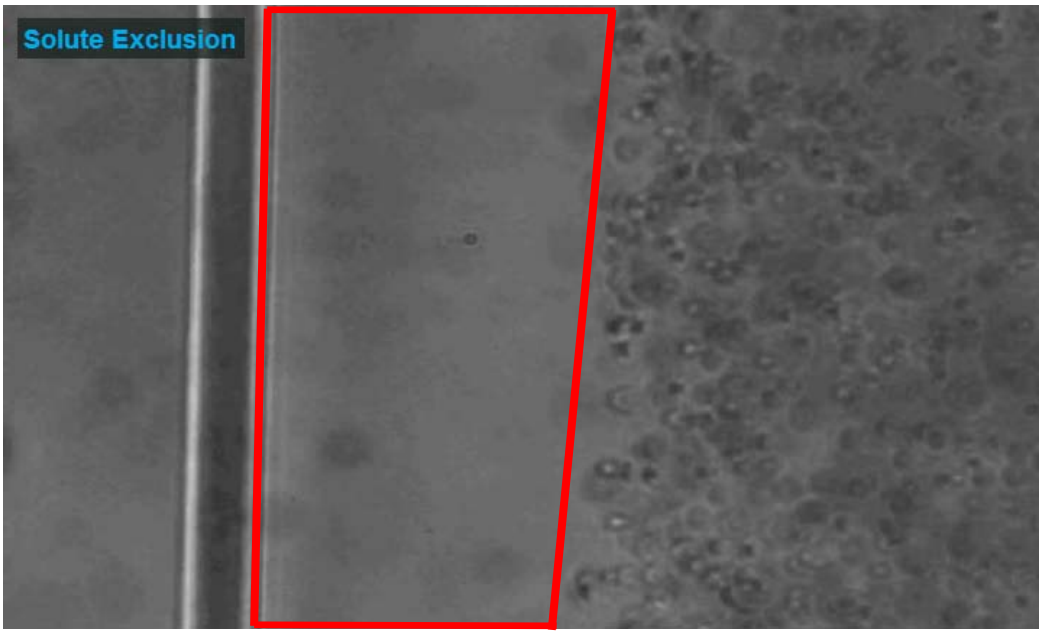


圖 4、水的第四相（紅線圍住之區域）

本次會議另邀請到 Darly Custom Technology 的Jim DiBattista博士演講，講題為『如何增加可撓式基板的黏滯力』，演講中提到可撓式基板是近來工業界主要的趨勢，也是軟性電子量產化很重要的材料之一，從先前使用的超薄玻璃、超薄金屬片，到近來使用的纖維織品、電子紙及塑料，產值都有逐年增加的趨勢（如圖5所示）。這些軟性電子可大量應用在電子紙、太陽能薄膜電池、水氧阻隔膜、醫療試片及RFID天線等領域。

Jim DiBattista博士認為，黏滯力最主要是受到鍵結（Bonding）所影響，常見的鍵結力依能量大小及鍵結方式不同可分以下五種（如圖6-10所示）：1.靜電力（Electrostatic）、2.氫鍵（Hydrogen bonding）、3. 機械式互鎖 / 錨定（Mechanical interlocking / Anchoring）、4.擴散 / 交纏（Diffusion / Entanglement）、5.共價鍵結 / 嫁接（Covalent bonding / Grafting），其中以共價鍵結 / 嫁接 的能量最強。工業是應用到黏滯力的產業常見的有：1.金屬/無機、2.印刷、3.硬鍍膜（Hard coat films）、4.擴散膜（Diffusion films）、5.安全膜（Safety films）。

演講中提到在鍍鈦、鉻、鋁等金屬時，由於其親氧性（Oxophillic）的特性，會從各種醚類（Ethers）、酯類（Esters）、羧基類（Carboxyl）、氫氧根類（Hydroxyl）及酮類（Ketones）等萃取氧氣，這些反應的產物通常是烯烴類（Olefins），會和金屬蒸氣反應而還原成強鍵結的化合物，如有機金屬類（Organo-metallic）、聚合觸媒（Metallocene）及螯合化合物（Chelated compounds）等，因而導致鍍膜品質不佳。然而雙軸向（Bi-axially oriented）的PET（Polyethylene terephthalate）通常具有晶相（Crystallinity）與非晶相（Amorphous）兩種區域，鍍金屬在晶相區域時常會有不易滲入的情形發生，故會先在表面上預鍍一層非晶相區作為緩衝層（buffer layer），如此可幫助金屬不但能更均勻滲入基材，且增加了黏滯力。

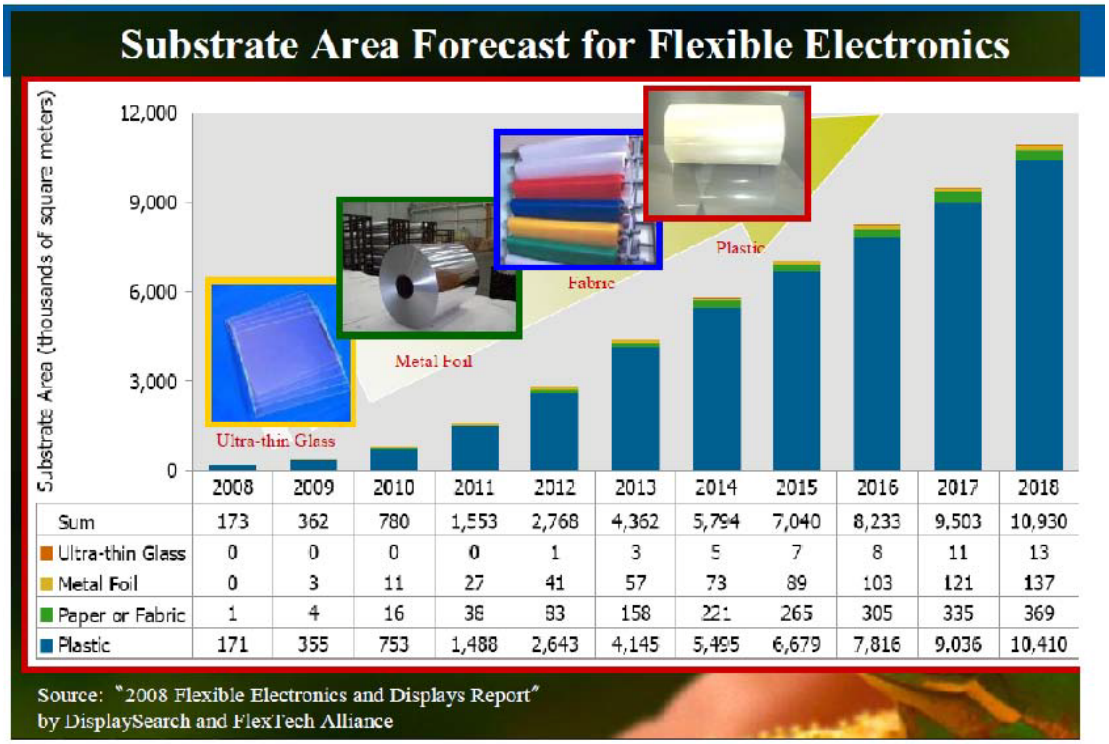


圖 5、軟性電子使用可撓式基板的趨勢預測

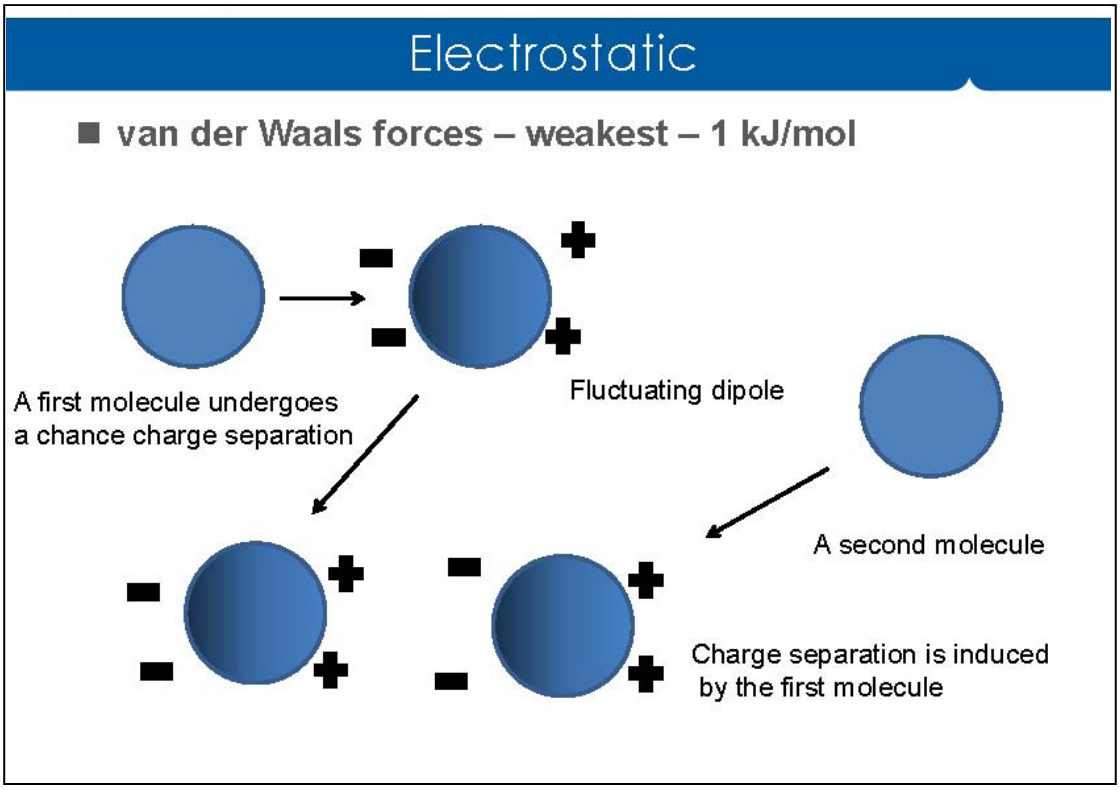


圖 6、常見鍵結之一：靜電力

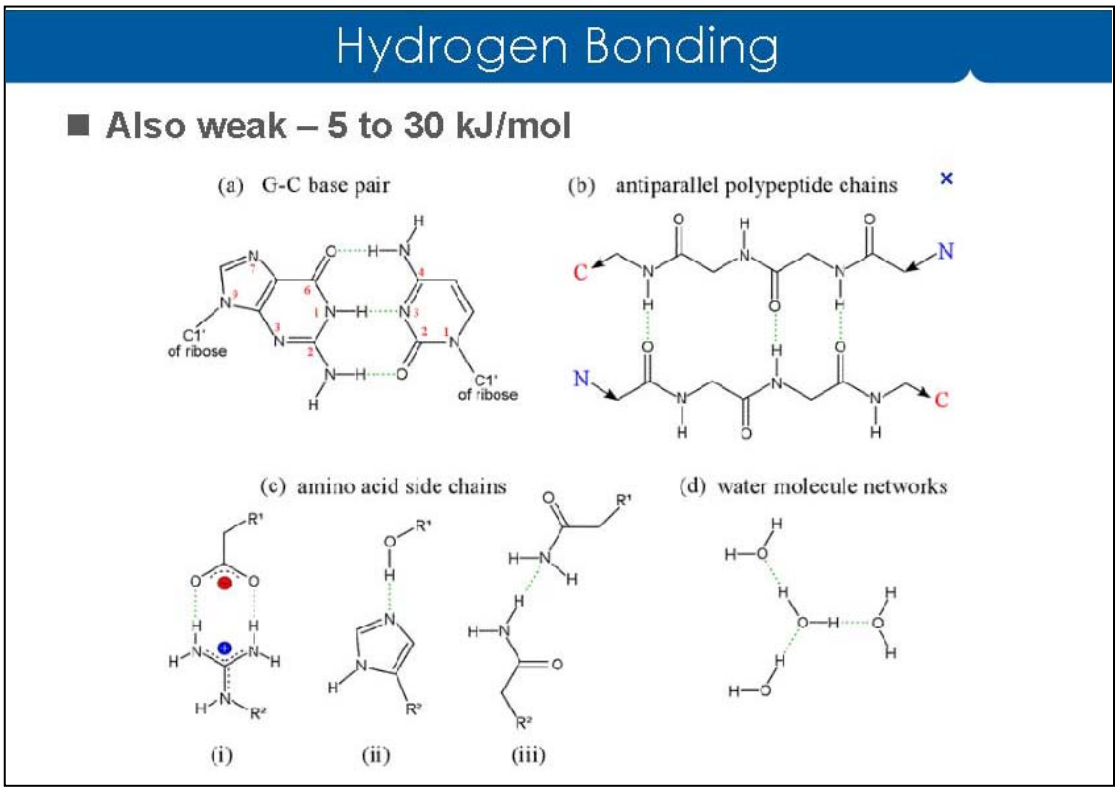


圖 7、常見鍵結之二：氫鍵

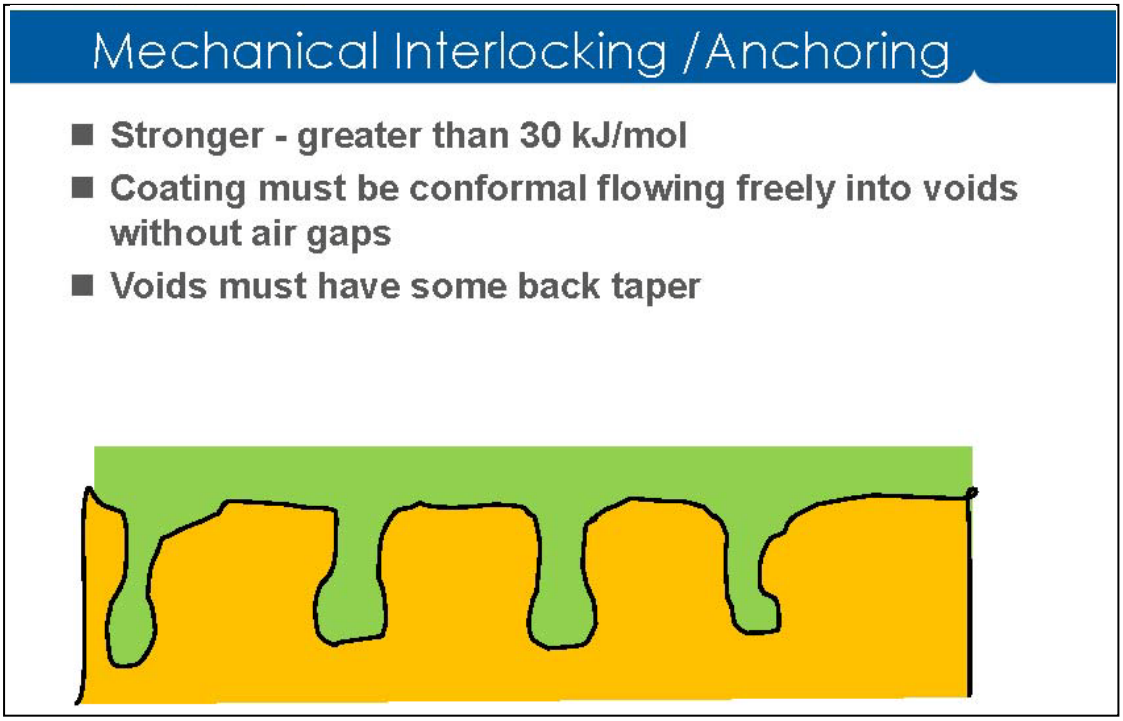


圖 8、常見鍵結之三：機械式互鎖 / 錨定

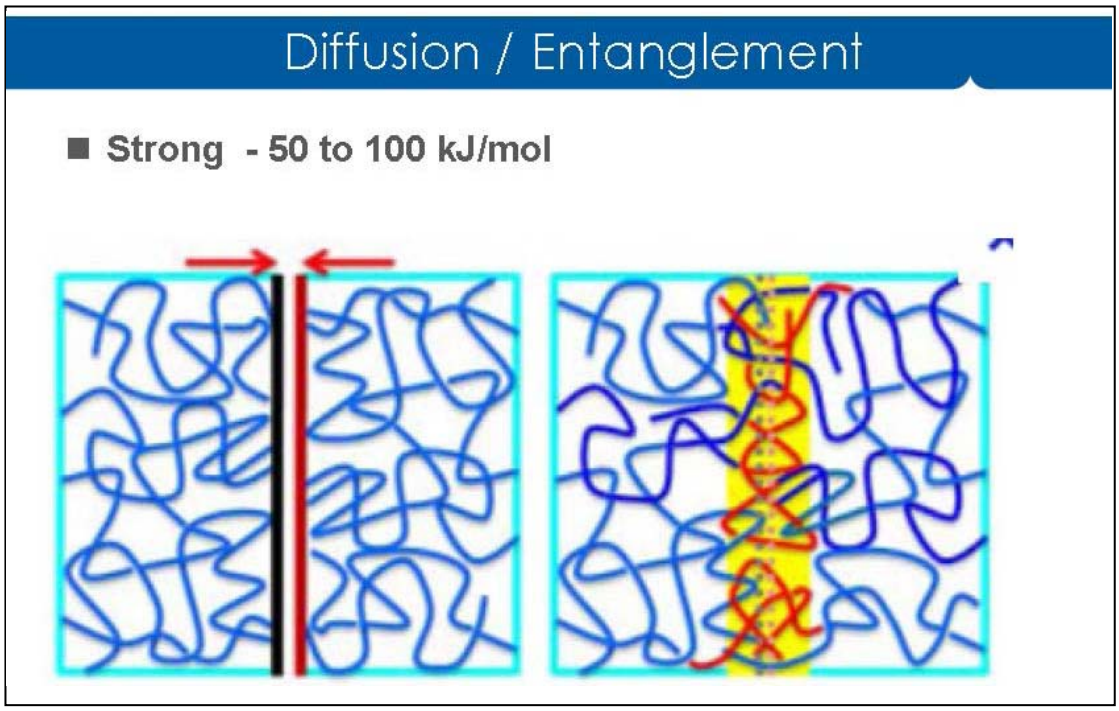


圖 9、常見鍵結之四：擴散 / 交纏

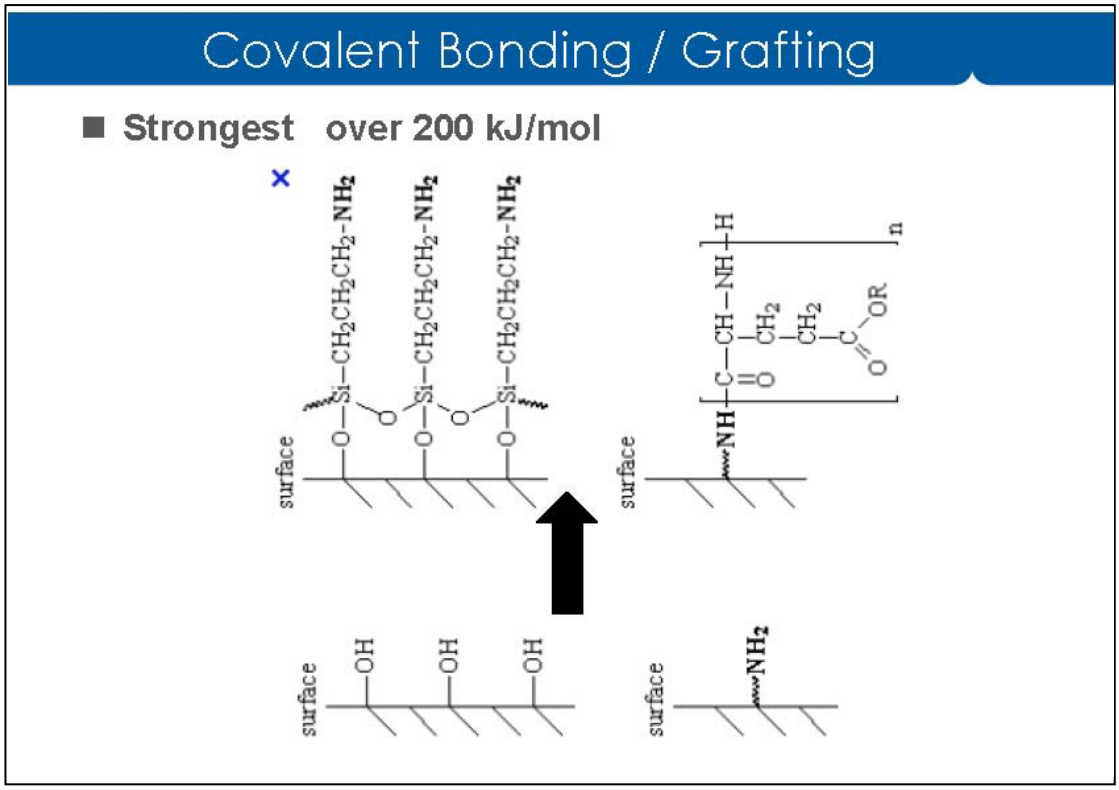


圖 10、常見鍵結之五：共價鍵結 /嫁接

Jim DiBattista博士也提到該公司最新發展了捲揚式有機/無機材料混合多層鍍膜設備（Hybrid Multi-Layer Coater, HML coater）（如圖11所示），該設備可在同一製程中完成連續鍍製有機及無機膜層交錯堆疊的多層薄膜，可有效增加可撓式基板的黏滯力，不但可提高塗敷精度與材料純度，準確鍍製所需厚度，也兼顧了降低原料成本、減少環境污染的作用。經實際在PET基板上預鍍一層polmer以達到平整基板的效果，經原子力顯微鏡（Atomic Force Microscope, AFM）觀測下可知其表面粗糙度（Roughness）約在100nm以內（如圖12所示）。

圖 11、Darly Custom Technology 發展捲揚式有機/無機材料混合多層鍍膜設備

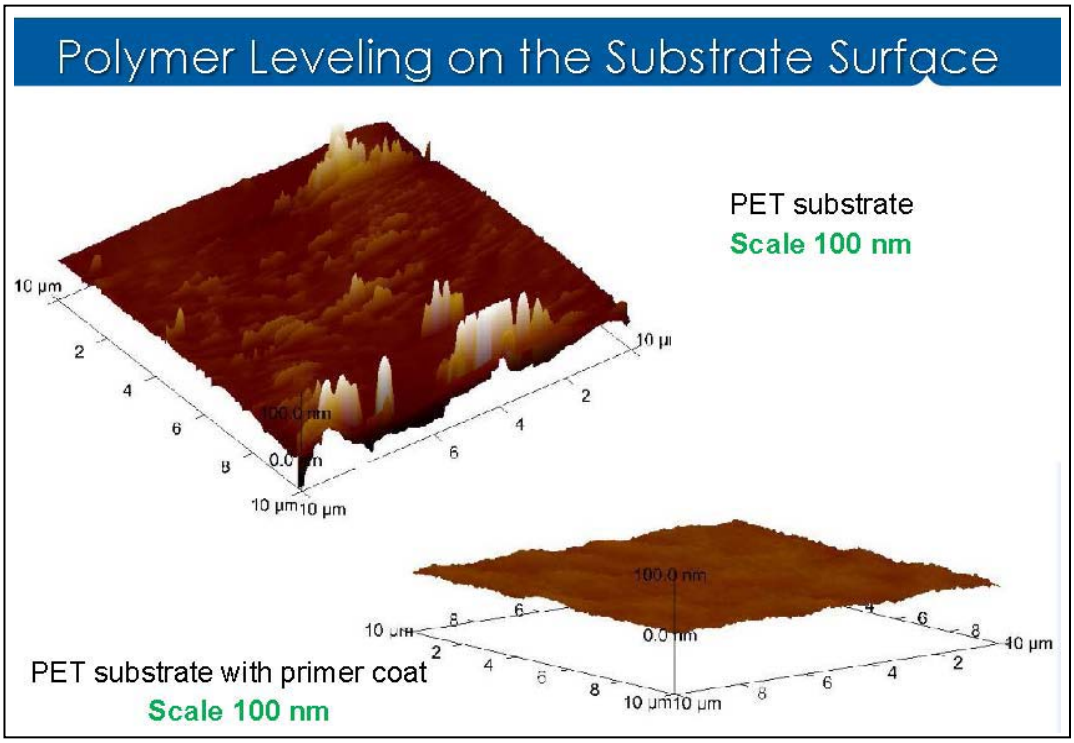


圖 12、AFM 觀測 PET substrate 的表面粗糙度

本次會議也邀請到康寧公司（Corning）的 Sean Garner 演講，講題為『利用捲揚式元件製造在可撓式玻璃基板的應用』，演講中提到該公司為為全球特殊玻璃及陶瓷材料的領導供應商，近期出產的 Willow™ Glass 為可撓式玻璃，其成分為無鹼矽硼酸（Alkali-free borosilicate）玻璃，其特色為膨脹係數低，且可耐高溫差，非常適合可撓元件使用（如圖 13 所示）。WillowTM Glass 可承受的溫度達 500 ℃，相較於目前常用的聚合物薄膜基板而言，此可撓式玻璃具有承受高溫製程的能力，有助於創造出輕薄且兼具成本效益的應用產品，目前已廣泛應用在各項領域上，包括觸控感測元件（如圖 14 所示）、軟性觸控面版、太陽能電池、照明光源、各類薄型顯示器如電泳顯示技術（Electro Phoretic Display, EPD）、膽固醇液晶顯示技術（Cholesteric Liqid Crystal Display, ChLCD）....等（如圖 15 所示）。

圖 13、康寧公司出產的可撓式玻璃 Willow™ Glass

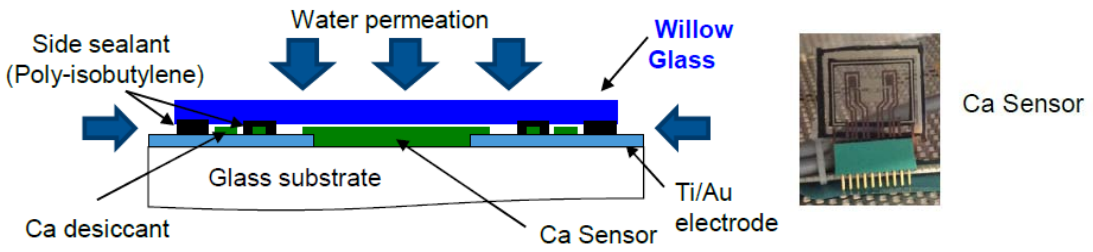


圖 14、Georgia tech 研發的 Ca-patch electrical sensor

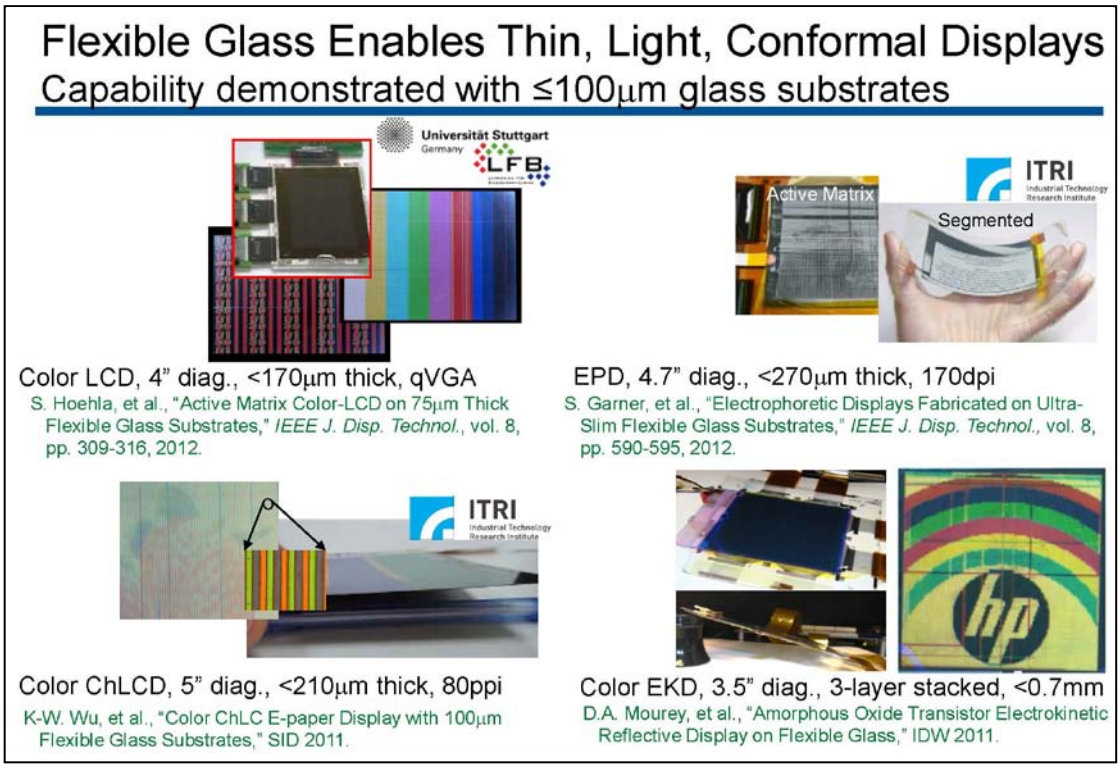


圖 15、各類薄型顯示器技術

相較於塑膠基板而言，可撓式玻璃具有極佳的光學穿透度（如圖 16 所示）、表面粗糙度（Roughness）較小（如圖 17 所示）、較佳的製程穩定性（如圖 18 所示）等優點，較不會出現如塑膠基板上常見之拉長、刮痕或品質變差的情況。此外，一般塑膠基板元件易因受熱膨脹造成密封性不佳而導致阻抗增加，使用玻璃為基板也擁有著較佳的密封性。Sean Garner 也提到了可撓式玻璃可承受很大的彎曲應力（Bend Stress），且厚度越薄其彎曲半徑（Bend Radius）越小（如圖 19 所示），以寬度 330 mm 的可撓式玻璃而言可捲成直徑 150 mm 之大小，玻璃上具有隔離層，以便在捲揚式鍍膜設備中傳輸（如圖 20 所示）；其剛性（Stiffness）正比於厚度立方，約相近於鋁的剛性（如圖 21 所示），至於表面所能承受的應力，則與玻璃材質有關，與玻璃厚度並無直接相關（如圖 22 所示）。綜合上述優點，使用玻璃基板製作出來的裝置相較塑膠基板而言特性更佳。

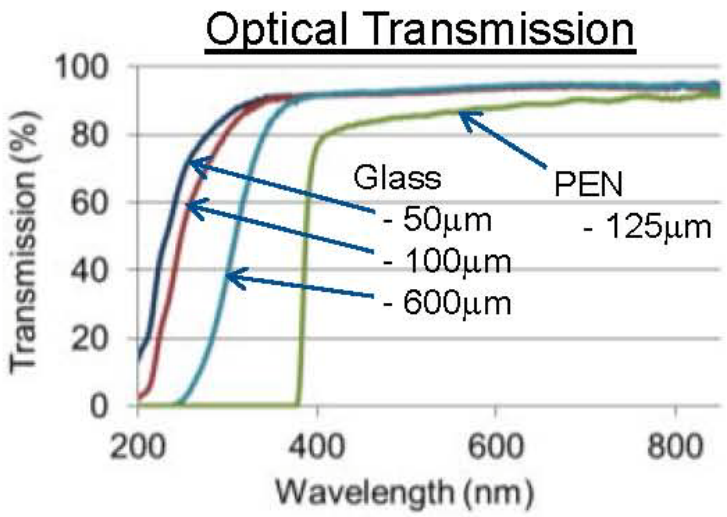


圖 16、可撓式玻璃與 PEN 的光學穿透度

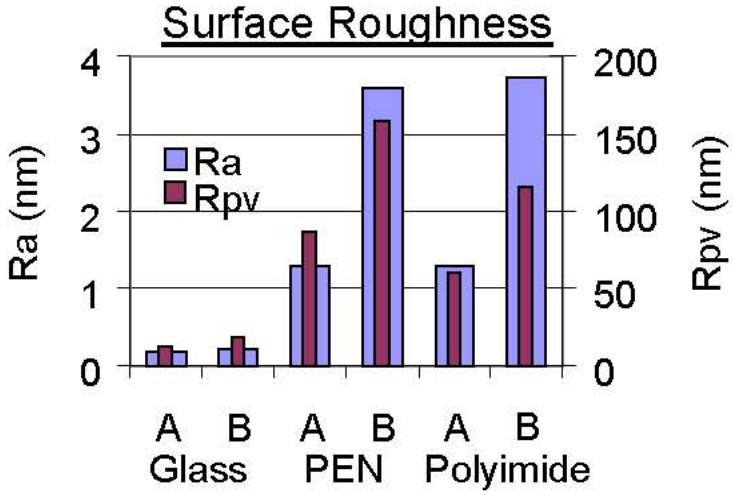


圖 17、可撓式玻璃、PEN 與 Polyimide 的表面粗糙度

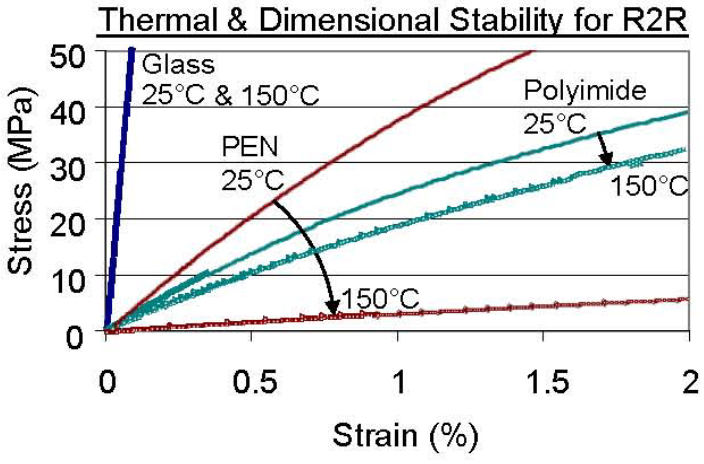


圖 18、可撓式玻璃、PEN 與 Polyimide 的穩定度測試

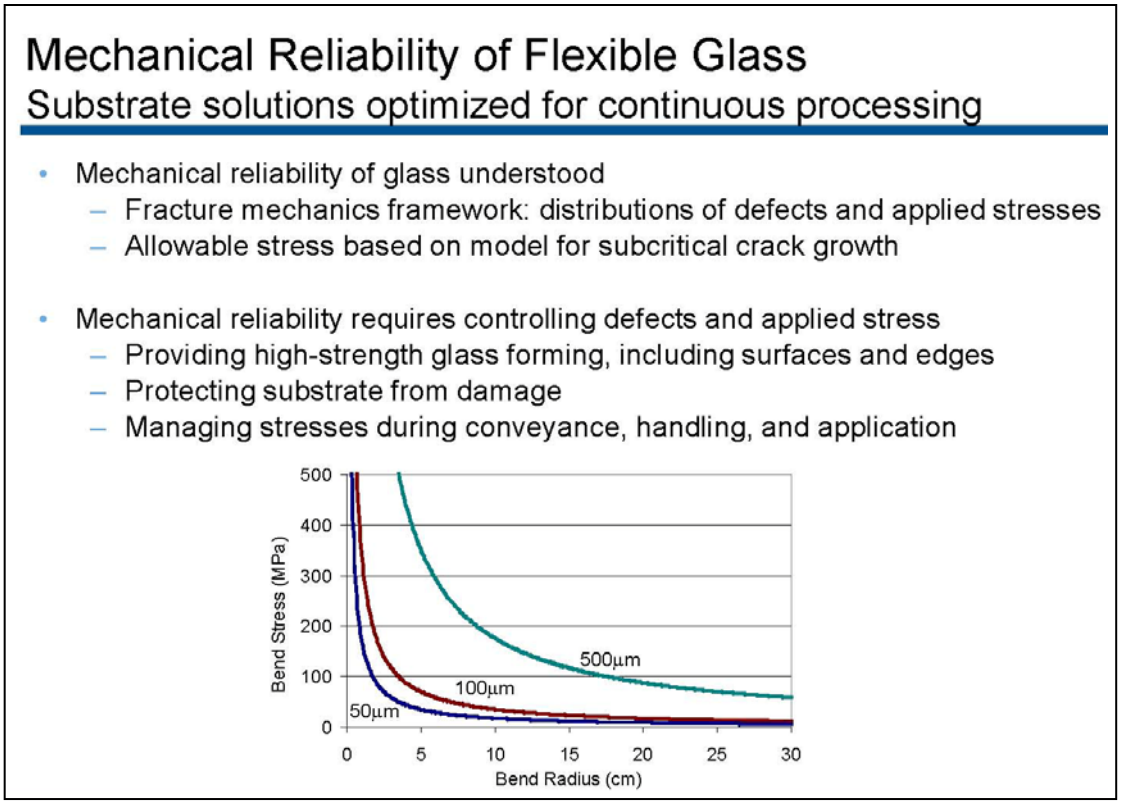


圖 19、不同厚度的可撓式玻璃承受的彎曲應力圖

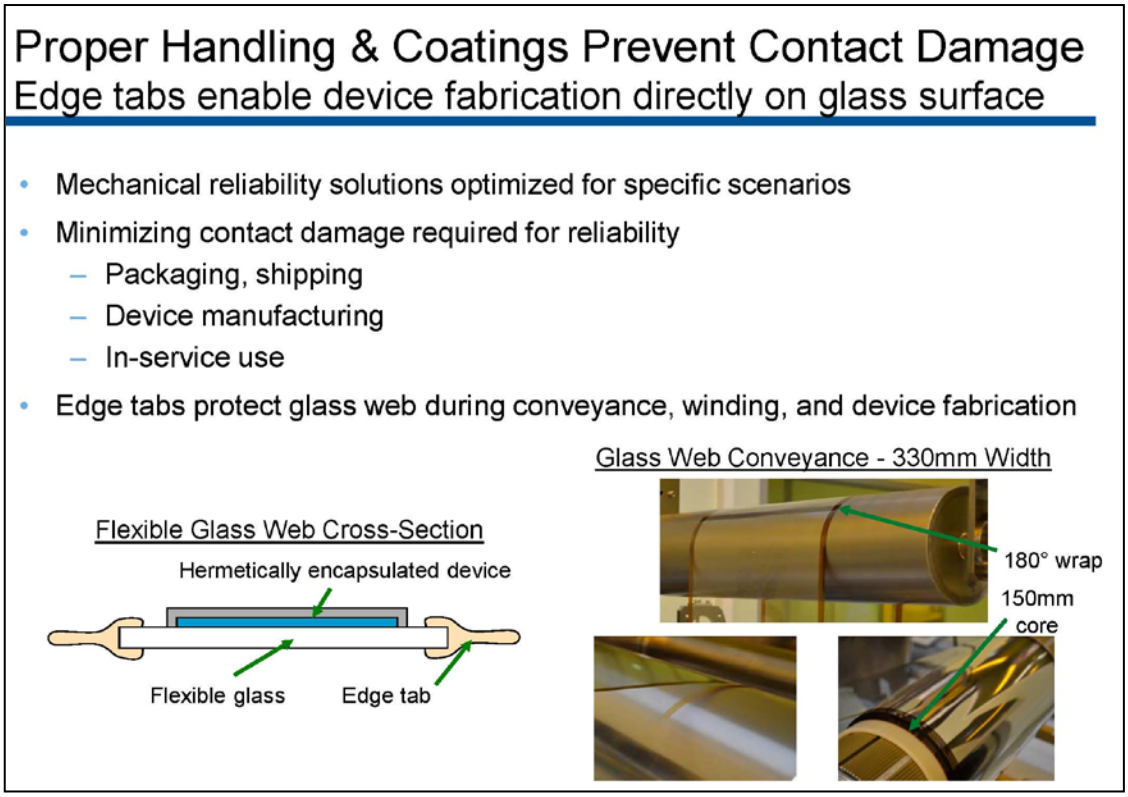


圖 20、在捲揚式鍍膜設備中傳輸的可撓式玻璃

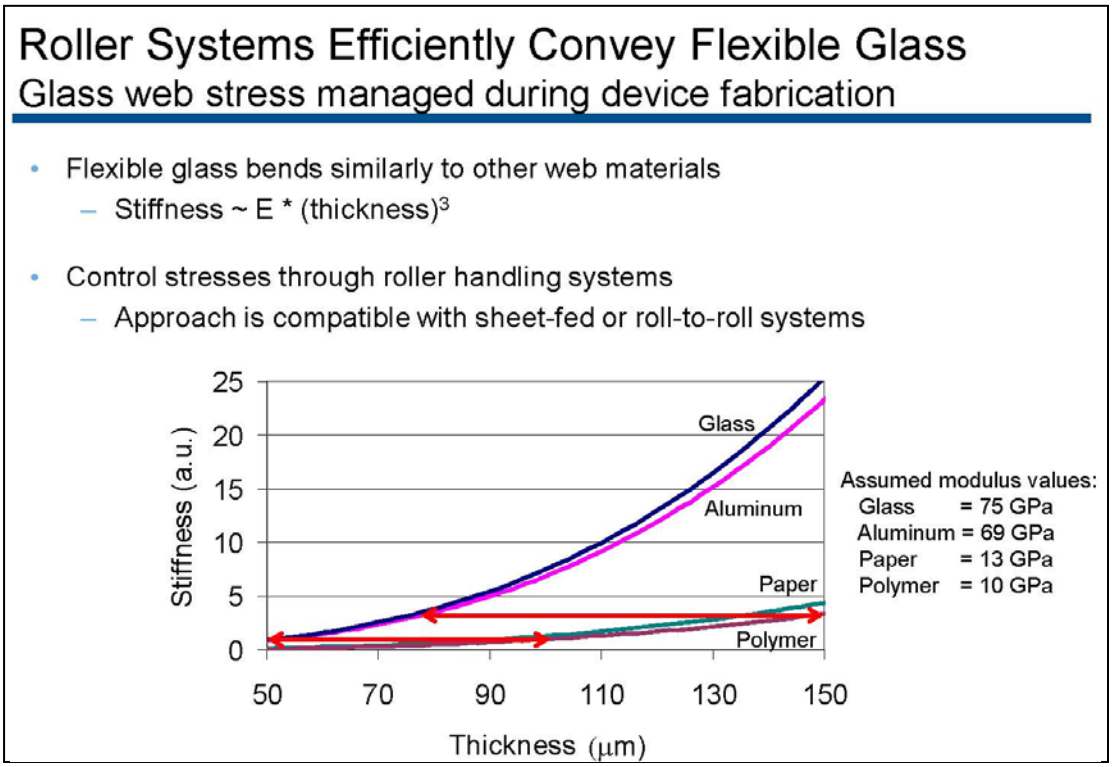


圖 21、可撓式玻璃與不同材料的剛性測試

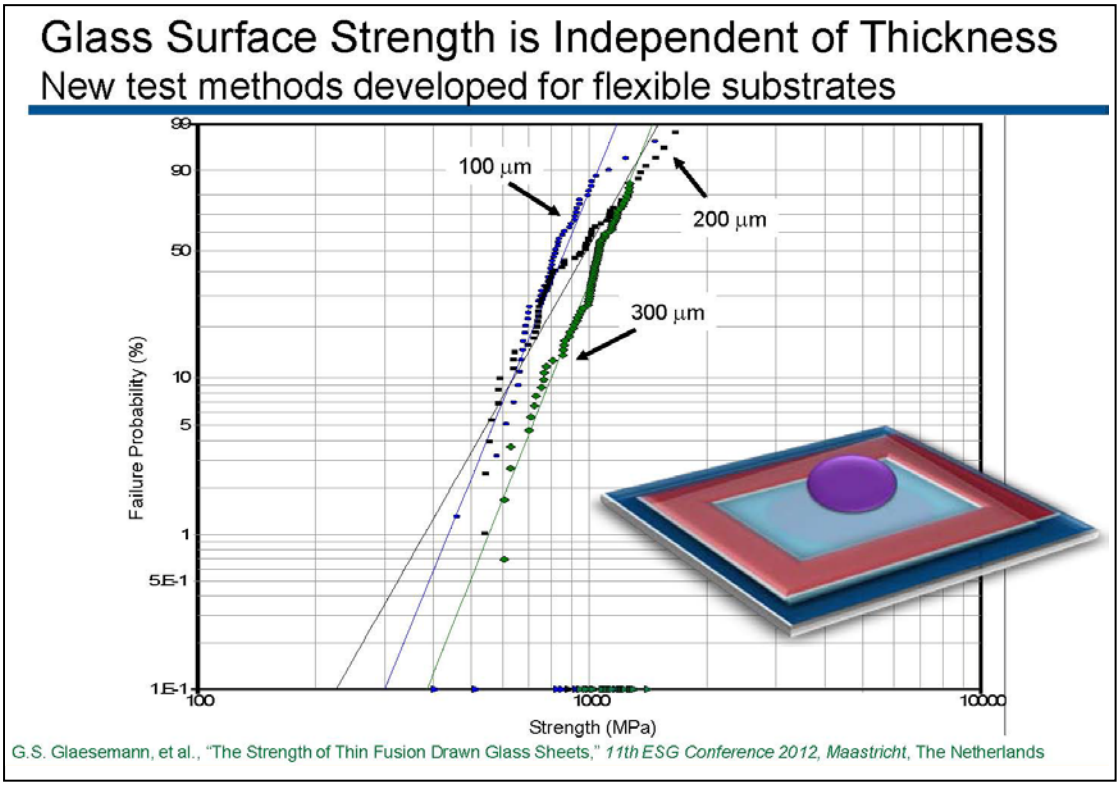


圖 22、不同厚度的可撓式玻璃表面所能承受的應力

目前最新研究以將可撓式玻璃導入連續捲揚式鍍膜製程中，從前端的鍍氧化銦錫（Indium Tin Oxide, ITO）薄膜、狹縫式塗佈（Slot Die Coating）、曝光（Exposure）、蝕刻（Etching），到真空鍍膜、雷射圖形製作（Laser Patterning）、網印（Screen Printing）、層合（Film Lamination）…等等（如圖 23-24 所示），都可連續一貫式作業，預期可大幅降低生產成本。目前智慧手機與平板的崛起，代表顯示器產業的需求以更輕薄、更高解析度、更低耗能為目標，相信以此可撓式玻璃搭配本所目前發展中的連續捲揚式鍍膜製程，必定具有相當大的產業發展潛力。

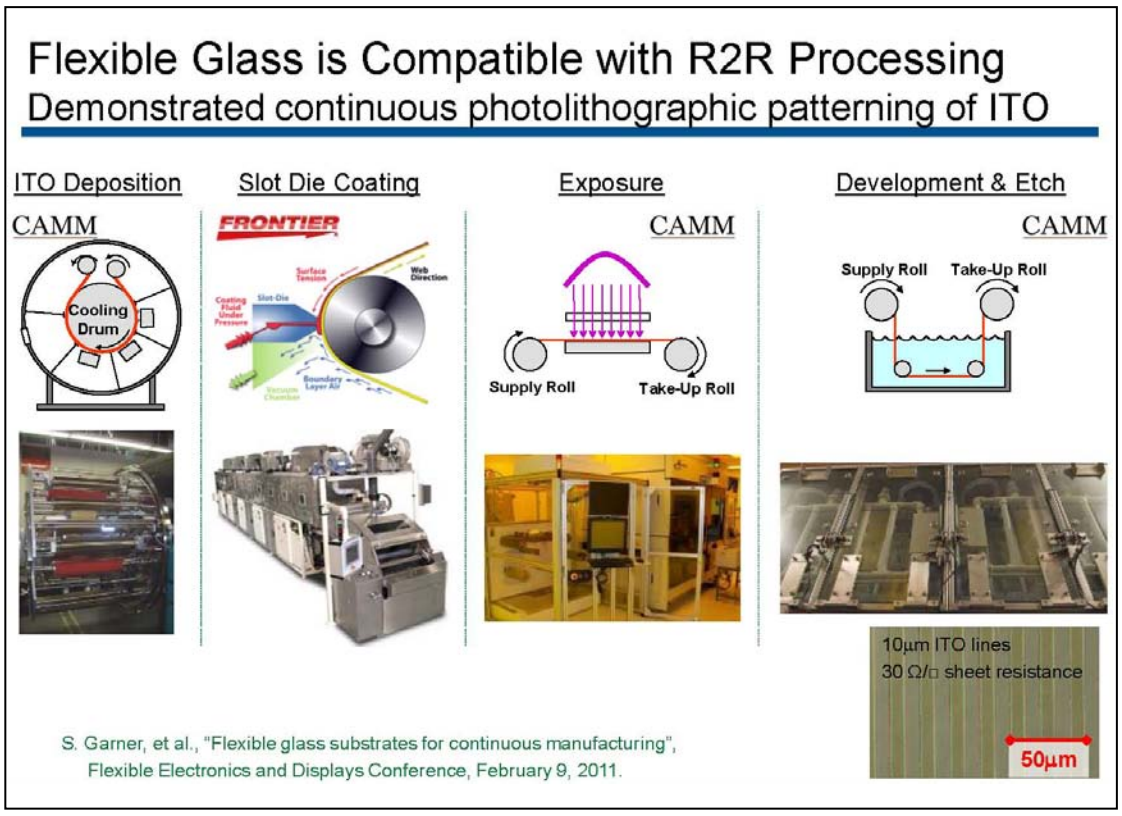


圖 23、連續捲揚式鍍膜製程：鍍製氧化銦錫薄膜、
狹縫式塗佈、曝光（Exposure）、蝕刻

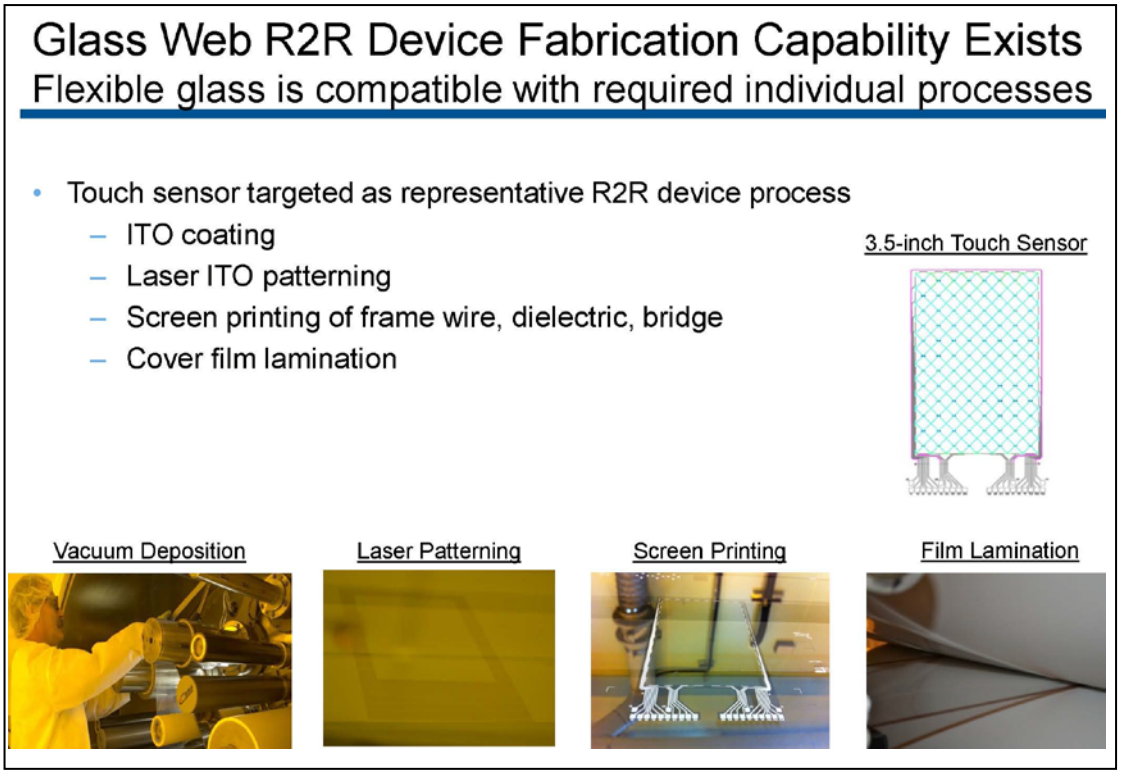


圖 24、連續捲揚式鍍膜製程：真空鍍膜、雷射圖形製作、網印、層合

本次會議也邀請到神戶鋼鐵公司（Kobe Steel, Ltd.）的 Yoshimitsu Ikari 演講，講題為『利用捲揚式設備在可撓式玻璃基板上鍍製氧化銦錫（Indium Tin Oxide, ITO）薄膜』，演講中提到神戶鋼鐵公司目前為世界五百大企業之一，事業版圖橫跨資源、工程機械、供電、不動產、能源….等領域，近年來更在電子顯示科技領域上多所著墨，其中氧化銦錫薄膜在手機、顯示器及太陽能領域上佔有很重要的地位。該公司利用捲揚式設備在可撓式 PET 基板上之鍍膜技術已發展相當純熟（如圖 25 所示），近來也在炙手可熱的超薄可撓式玻璃基板上成功鍍製品質極佳的氧化銦錫薄膜，整捲超薄玻璃是由日本電氣硝子公司（Nippon Electric Glass Co., Ltd.）所提供，厚度僅約 50 μm，寬度可達 300 mm，長度為 10 m，可捲成約半徑 40 mm，特別的是無須拋光下其粗糙度僅約 1～2 Å，比起單晶矽更為平整。在溫度 300℃條件下能以鍍率約 12.7～38 nm/min 濺鍍厚度為 190 nm 的氧化銦錫薄膜且結晶性佳（如圖 26 所示），其片電阻（sheet resistance）僅約 7.5 Ω/sq，電阻率約為 1.43 x 10^{-4} Ωm，穿透率可達 83.2%（如圖 27 所示），相信該公司穩定且優異的薄膜品質能在顯示產品上有相當廣泛的應用。

和本組濺鍍氧化銦錫薄膜品質相比，由於鍍在元件上無法加熱至過高的溫度，故在溫度 90℃條件下鍍膜厚度為 300 nm，其片電阻約 15 Ω/sq，電阻率約為 4.5 x 10^{-4} Ωm，穿透率約達 80%，在薄膜品質上是略微差於神戶鋼鐵公司，推測主因是由於鍍膜溫度不同而影響薄膜特性，若改為溫度 200℃條件下鍍膜，其片電阻可降為 10 Ω/sq，電阻率可降為 2.5 x 10^{-4} Ωm。

圖 25、神戶鋼鐵公司發展捲揚式氧化銦錫濺鍍設備

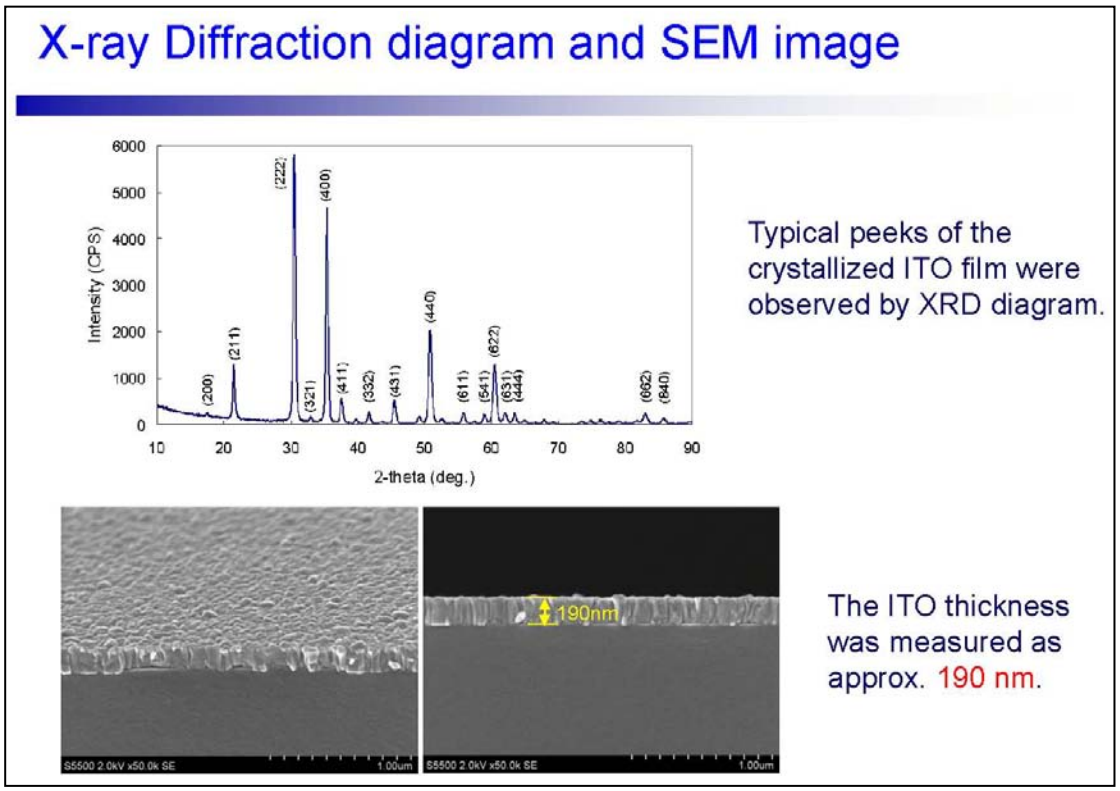


圖 26、神戶鋼鐵公司鍍製氧化銦錫薄膜之 XRD 圖與 SEM 圖

Electrical property of ITO film

Substrate Thickness (μm)	ITO Thickness (nm)	Sheet resistance (ΩSq)	Resistivity (μΩcm)	Carrier concentration (cm^{-3})	Carrier mobility (cm^2/Vs)	Total light transmittance (%)
50	190	7.5	143	1.17×10^{21}	37.3	83.2

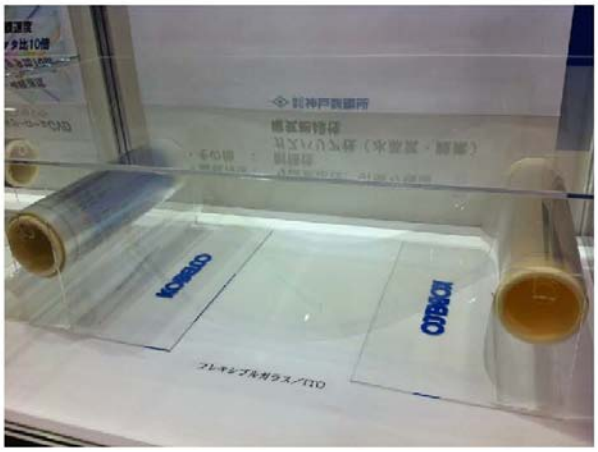
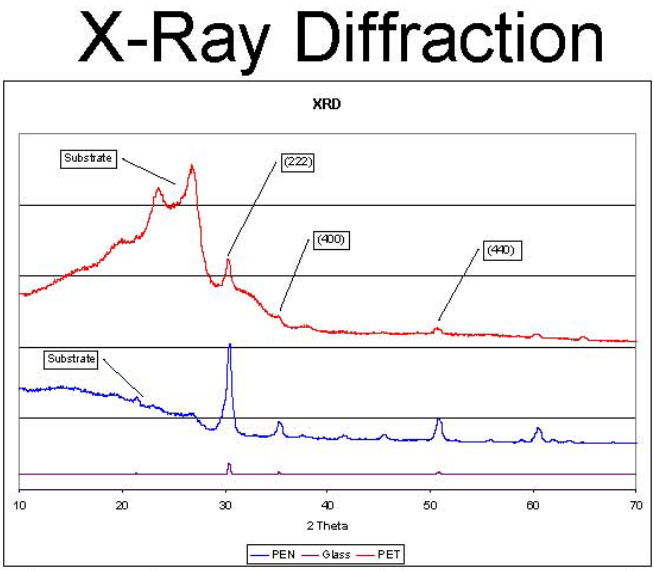


圖 27、神戶鋼鐵公司鍍製氧化銦錫薄膜之電性測試

本次會議也邀請到紐約州立大學賓漢頓分校（State University of New York at Binghamton）先進微電子製造中心的James Switzer演講，講題為『比較捲揚式設備在不同可撓式基板上鍍製氧化銦錫薄膜的差異性：以可撓式玻璃、聚萘二甲酸乙二醇酯（PEN）與聚對苯二甲二乙酯（PET）為例』，其中先進微電子製造中心（Center for Advanced Microelectronics Manufacturing, CAMM）是由美國顯示科技聯盟在學術機構所建立的研發中心，以研發電子封裝技術與小尺寸系統整合技術為主，並開發捲揚式系統作為軟性電子製造設備，該單位匯集了政府、學術界及工業界的資源，目標是共同研發軟性電子設備及製程相關技術。

James Switzer 在演講中提到其所使用的三種可撓式基板分別為可撓式玻璃、聚萘二甲酸乙二醇酯（Polyethylene Naphthalate, PEN）及聚對苯二甲二乙酯（Polyethylene Terephthalate, PET），來源分別是康寧公司（Corning）的 Willow™ Glass、Teonex 公司的 Q65FA PEN 及杜邦公司（Dupont）的 Teijjen ST505 PET，而氧化銦錫薄膜是利用 90/10 的三氧化二銦（In_2O_3）/二氧化錫（SnO_2）靶材濺鍍而成。在不同的可撓式基板上各有其適合的濺鍍溫度，在可撓式玻璃與 PEN 上為 175℃，而 PET 則為 125℃。

針對鍍製在不同可撓式基板上的氧化銦錫薄膜以 X 光繞射（X-ray Diffraction, XRD）來分析（如圖 28 所示），發現皆有良好的結晶相，但以可撓式玻璃的晶粒（Grain size）較大，這點也可由其電子顯微鏡（Scanning Electron Microscope, SEM）影像得知（如圖 29 所示），是較大顆且接近矩形結構的形狀。



Sample	Grain Size (nm)	(222)/(400) Ratio
Glass	26.87	4.24
PEN	11.94	4.58
PET	5.06	2.96

圖 28、CAMM 在不同可撓式基板上鍍製氧化銦錫薄膜之 XRD 圖

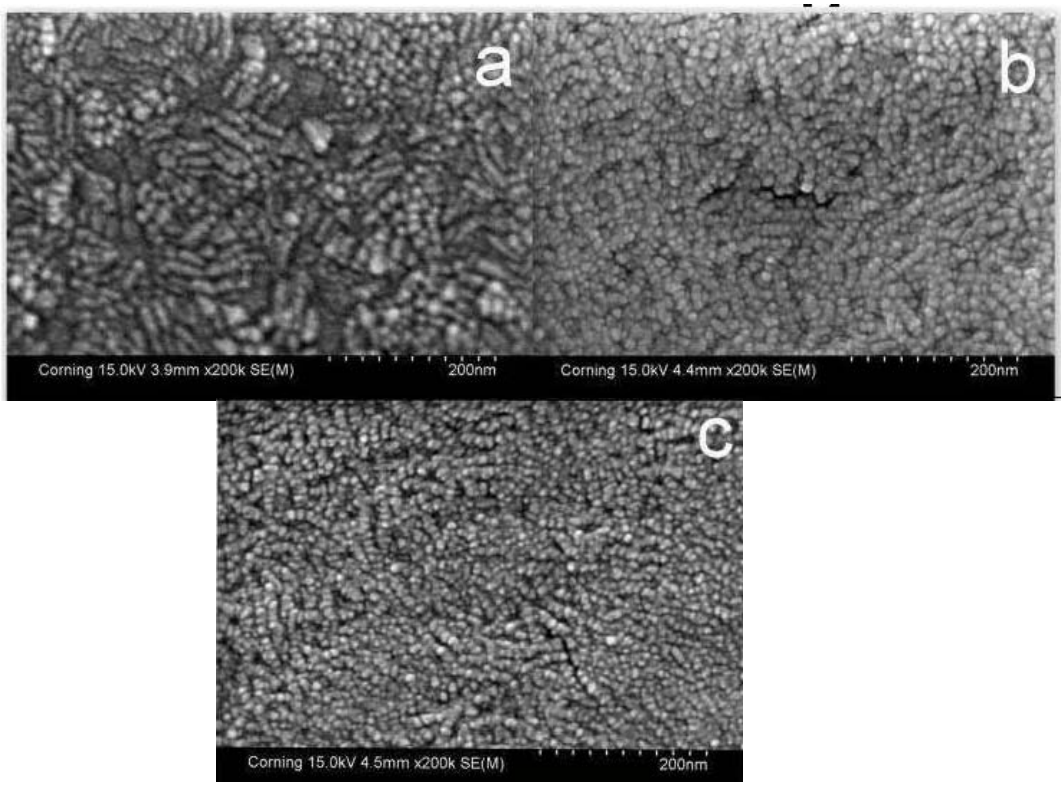


圖 29、CAMM 在不同可撓式基板上鍍製氧化銦錫薄膜之 SEM 圖：
(a) Glass、(b) PEN、(c) PET

而在原子力顯微鏡（Atomic Force Microscope, AFM）觀測下可知（如圖 30 所示），可撓式玻璃的表面較為平坦，優於 PEN。利用穿透式電子顯微鏡（Transmission Electron Microscope, TEM）觀測下可知（如圖 31 所示），可撓式玻璃與 PEN 的厚度約在 68.4nm 左右，而矽層約在 19-20 nm 左右; 且可撓式玻璃的結構較具有一致性（Uniformity），而 PEN 的結構有許多的波浪狀紋路，一致性較差 （如圖 32 所示）。

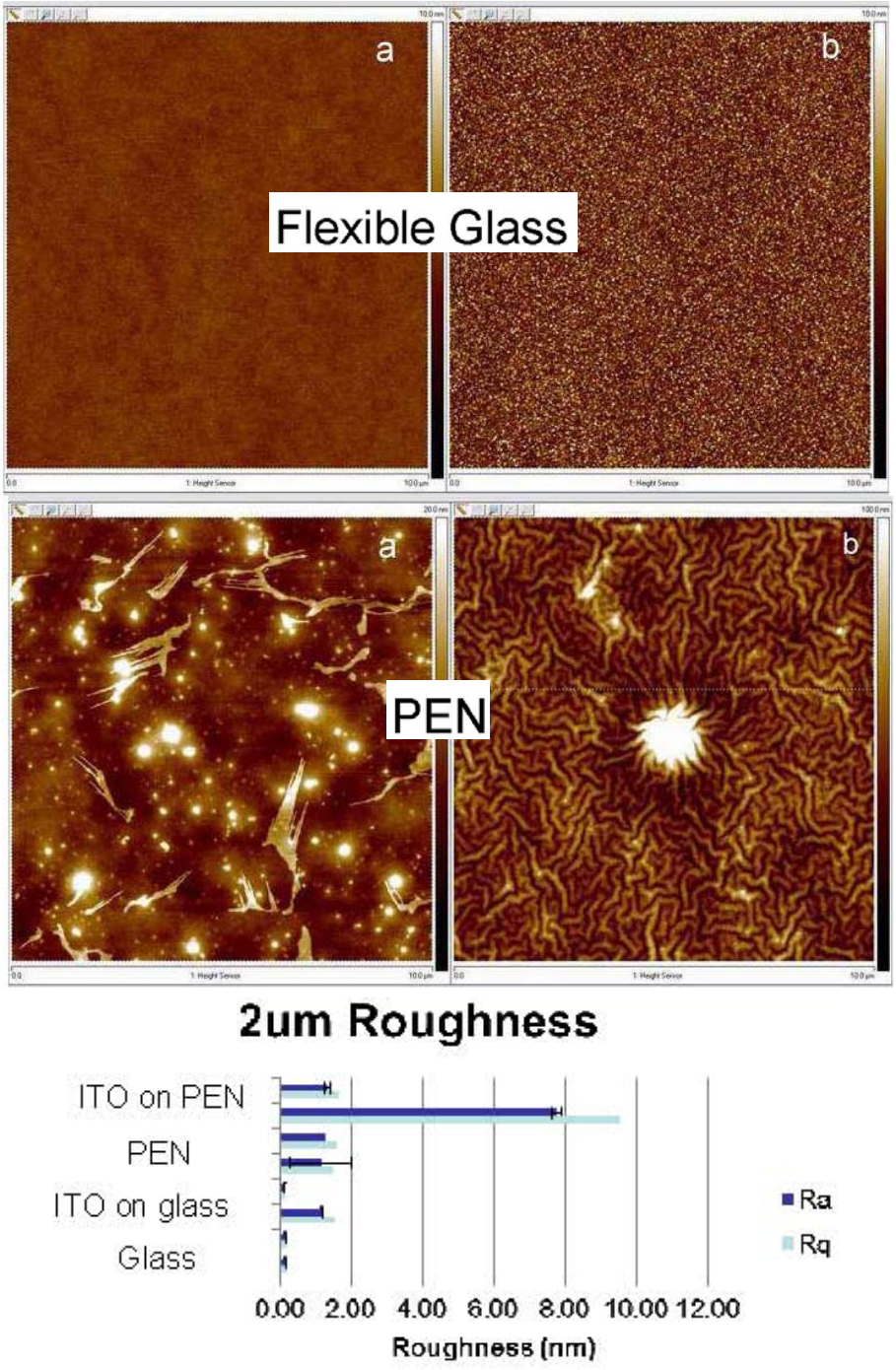


圖 30、CAMM 在不同可撓式基板上鍍製氧化銦錫薄膜之 AFM 圖及表面粗糙度：(a) Uncoated、(b) Coated

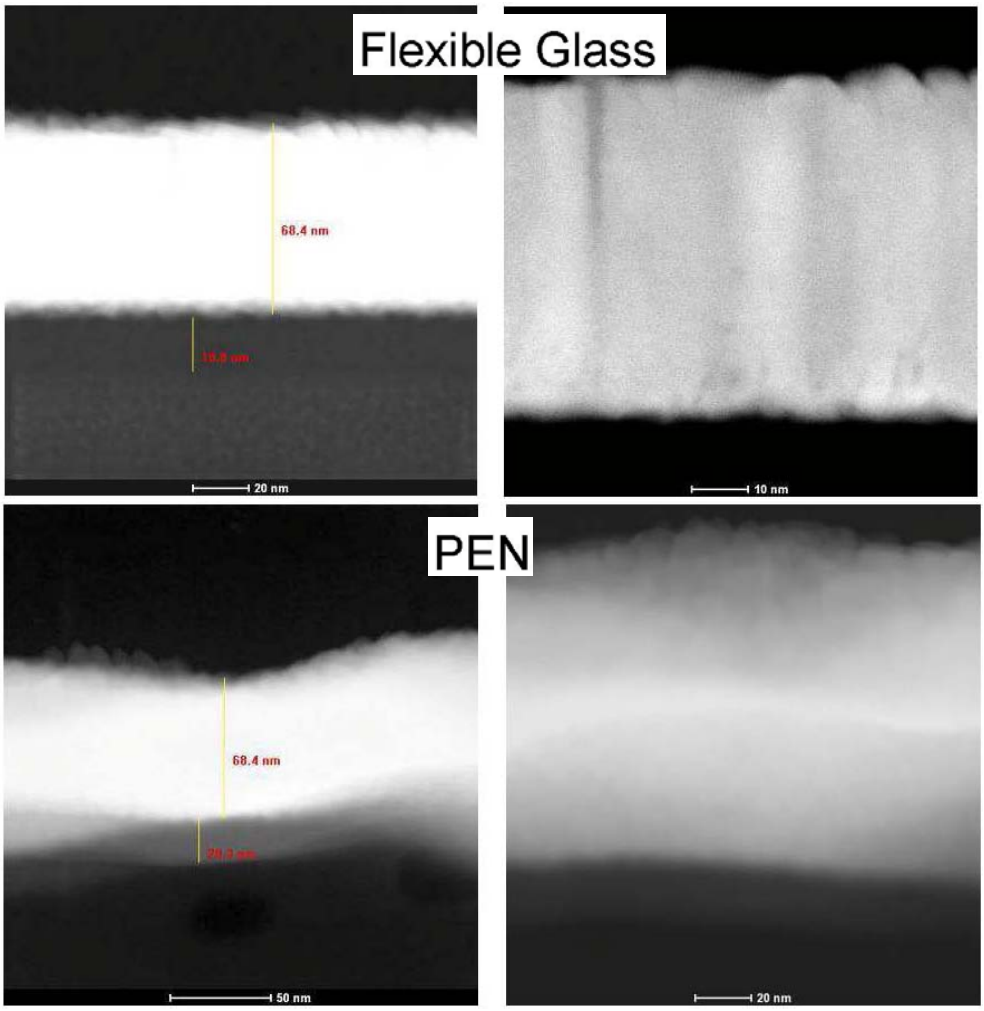


圖 31、CAMM 在不同可撓式基板上鍍製氧化銦錫薄膜之 TEM 圖

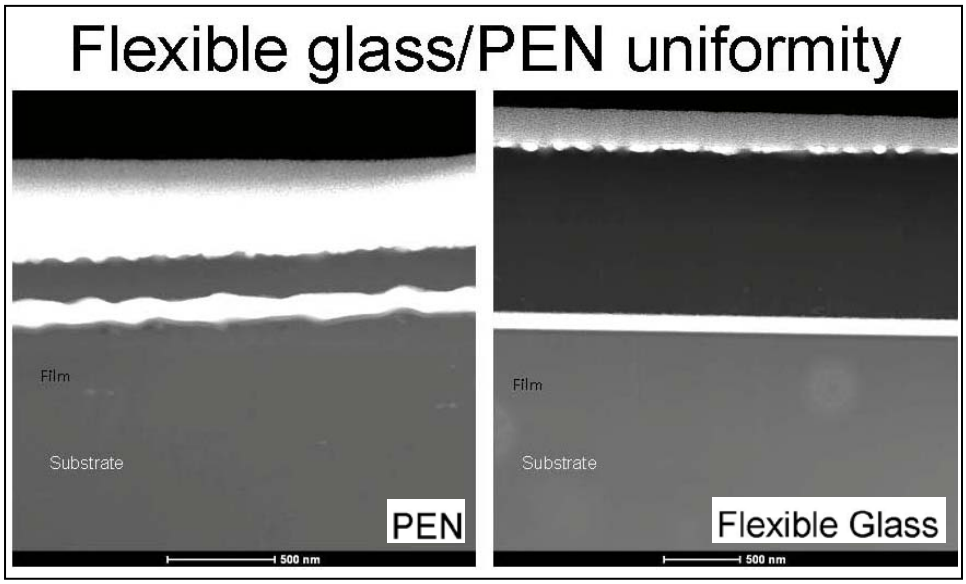


圖 32、TEM 圖比較在不同可撓式基板上鍍製氧化銦錫薄膜之一致性

針對在三種可撓式基板上的氧化銦錫薄膜做電性量測（如圖 33 所示），發現可撓式玻璃與 PEN 的導電性較佳，兩者皆遠優於 PET。進而比較其穿透率（如圖 34 所示），在波長 550 nm 的穿透率，也是以可撓式玻璃及 PEN 的穿透率較高，推測原因與基板材質及表面粗糙度有關。至於在 UV 光的部分，則是以可撓式玻璃的穿透率最佳。接著將可撓式玻璃與 PEN 基板上的氧化銦錫薄膜做環境測試（如圖 35 所示），發現隨著擺放的時間增加，在 PEN 基板上的氧化銦錫薄膜之片電阻（Sheet Resistance）不斷上升，放置 28 天後片電阻甚至可升至近六倍左右; 反之在可撓式玻璃基板上的氧化銦錫薄膜則相當穩定，片電阻值大小皆無增加之傾向。James Switzer 認為，在可撓式玻璃基板上的氧化銦錫薄膜具有較佳的穿透率、較高穩定性、較為平坦及片電阻小等優點，的確很適合作為新一代捲式製程軟性電子基材的材料。

Sample	Sheet Resistance (ohms/sq)	Bulk Resistivity (10^{-4} ohm*cm)	Transmission at 550 nm	Figure of Merit (10^{-4} ohm^{-1})
Glass	51.3	3.59	78.1	16.46
PEN	47.8	3.35	74.6	11.17
PET	62.5	4.36	70.5	4.85

圖 33、CAMM 在不同可撓式基板上鍍製氧化銦錫薄膜之電性量測

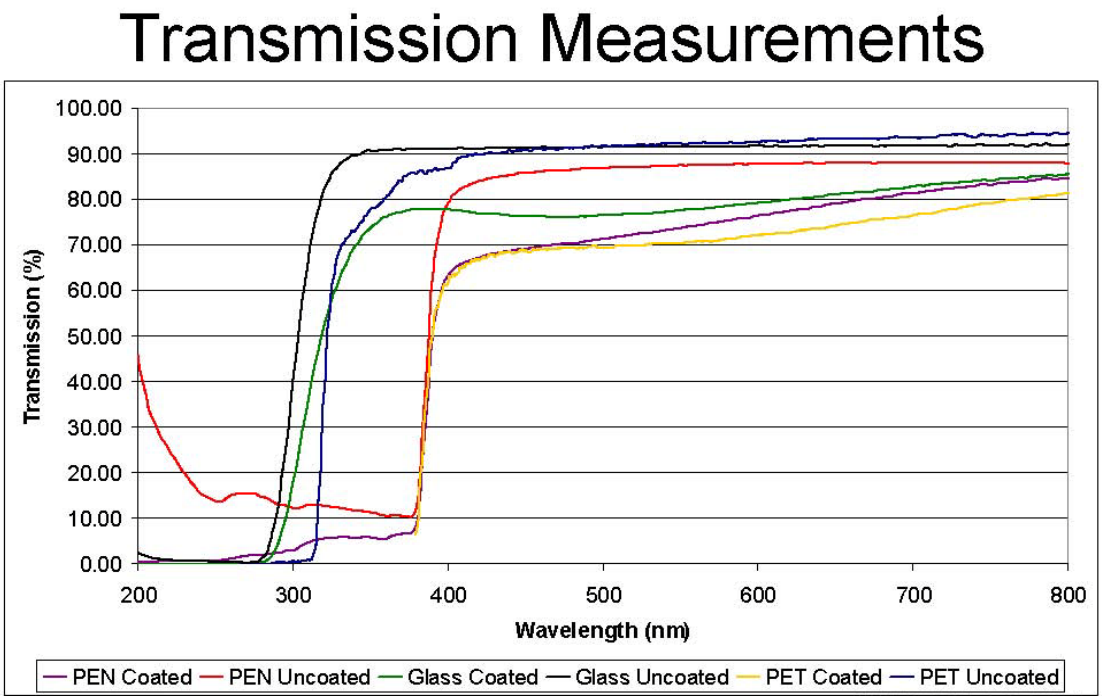


圖 34、CAMM 在不同可撓式基板上鍍製氧化銦錫薄膜之穿透度量測

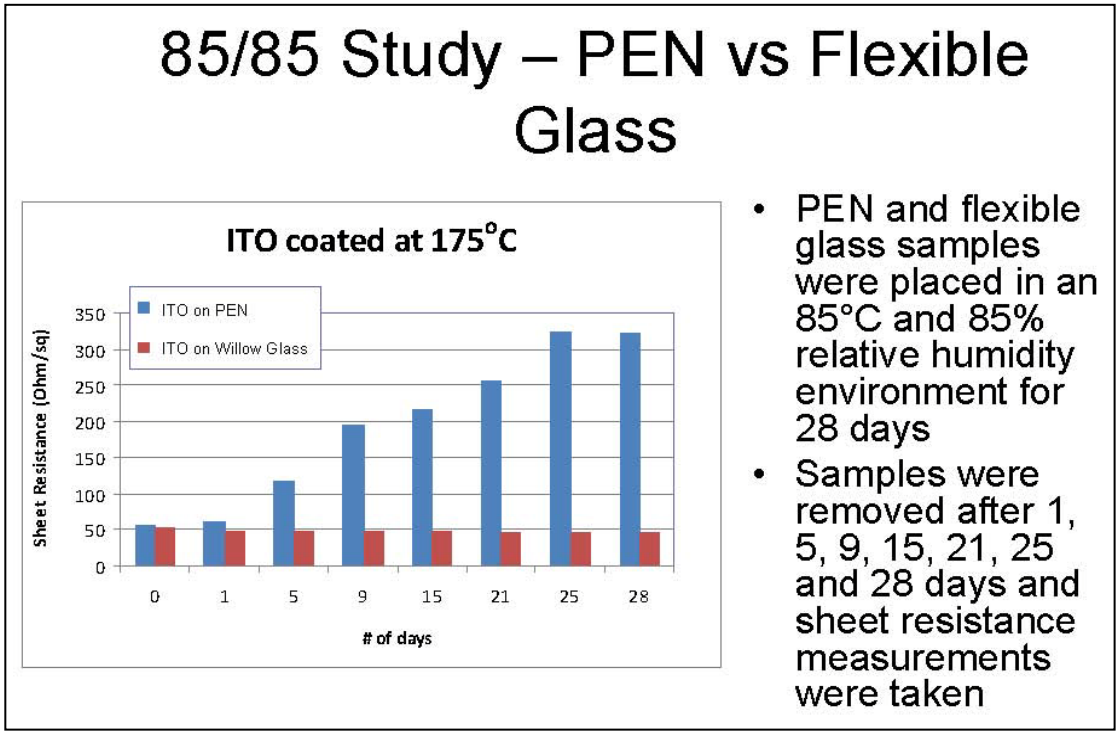


圖 35、CAMM 在不同可撓式基板上鍍製氧化銦錫薄膜之穩定度測試

本次出國參加會議，不但可增廣見聞，且藉由互相交流汲取知識，從中提升了自身研究水準與相互競爭力，還可進一步促使我國在國際上站上重要地位，無論是在學理上或文化上，著實收穫甚多。更重要的是這樣的交流場合能與各國從事捲揚式設備相關領域人員多所交流，接收到這些不同觀點不同看法對於開拓未來研究方向擁有著極大的助益; 除此之外也和這些研究人員彼此交換聯絡方式，建立了日後請益及合作的基礎。

四、 建議事項

本次出國公差前往美國模特爾比奇市參加由美國金屬鍍膜塗佈及夾層行業協會舉辦的『2012 Web Coating & Handling 國際研討會』，聆聽捲揚式設備暨可撓式產品最新技術，並進行技術與資訊交流，以協助確立所內相關研發方向。綜合此次公差的心得與親身經歷，提出以下建議：

(一) 捲揚式鍍膜技術為光電元件暨軟性顯示器未來發展之主流，此研發方向與本所目前在捲揚式領域開發次世代節能元件的發展方向一致，本人於會中口頭發表捲揚式電漿鍍膜設備研發成果論文，演講結束後有數名國外學者針對演講內容紛紛提問並表示極大的興趣，顯示本所開發之捲揚式電漿鍍膜設備以達國際上頂尖的水平，建議在技術開發過程須與國內外廠商共同參與合作開發，方能發揮計畫效益。

(二) 捲揚式鍍膜領域已是目前當紅的研究領域，但此次參與盛會時發現國內出席者相當地少，鑑於本會議為歷年來所辦規模最大、參與人數最多的國際重要會議，邀請了來自世界各地相關領域傑出的研究者及工業界人士出席，建議國內暨本所相關領域研究者及工業界人士能踴躍出席，除了能拓展我國暨本所在國際產學界的能見度之外，相信在理論及技術上之提升必有相當助益，且藉由搜集業界捲揚式薄膜製程設備及技術開發最新研究資訊，瞭解國外研發現況、市場及未來發展方向以期能增加國際研究之合作對象。

五、 附件

附件一

Sunday, October 21, 2012			
Track:	Short Courses		
9:00 AM - 12:30 PM	A Practical Approach To Eliminate Web Wrinkling LOCATION: Tides 2 *Timothy J. Walker, TJWalker+Associates, Inc.* *Dr. Dilwyn P. Jones, Emral Ltd.* *Dr. David R. Roisum, Finishing Technologies*	Electrostatics In Web Handling LOCATION: Tides 1 *Kelly Robinson, Electrostatic Answers*	
1:30 PM - 5:00 PM	Winding: Equipment, Mechanics, And Roll Quality LOCATION: Tides 2 *Timothy J. Walker, TJWalker+Associates, Inc.* *Dr. Dilwyn P. Jones, Emral Ltd.* *Dr. David R. Roisum, Finishing Technologies*	Turret Winder Drives LOCATION: Tides 1 *Clarence Klassen, KlassENgineering, Inc.*	How Substrate Quality And Cleanliness Affects Roll-To-Roll Vacuum Deposition LOCATION: Heron *Dr. Charles Bishop, C.A. Bishop Consulting Ltd.*
6:00 PM - 7:00 PM	Keynote: On A Roll With Graphene LOCATION: Atlantic 6 - 8 *Dr. Yvette Hancock, Department of Physics, University of York*		
7:00 PM - 9:00 PM	Web Coating Conference Opening Reception And TableTops LOCATION: Atlantic 4 & 5		
Monday, October 22, 2012			
Tracks:	Web Coating & Laminating LOCATION: Atlantic 6 - 8	Vacuum Web Coating LOCATION: Atlantic 1- 3	Web Handling LOCATION: Oleander Ballrm
7:00 AM - 9:00 AM	BREAKFAST LOCATION: Atlantic 4 & 5		
Sessions:	Lean Manufacturing *Session Leaders: Greg Williams, Kelly Robinson*	Substrate Surface And Coating Growth *Session Leaders: Greg Tullo, Bob Bakish*	Drives *Session Leader: Ken Guhse, David Roisum*
8:25 AM	Welcome And Introductions	Welcome And Introductions	Welcome And Introductions
8:30 AM	A Study Of How Lean Manufacturing Benefits Both Manufacturers And Customers *Stephen Huff, Imperial Rubber Products, Inc.*	Cummulated Surface Treatment... *Rory Wolf, Enercon*	Additions To Your Drive System *Clarence Klassen, KlassEngineering*
9:00 AM	Value Stream Mapping In The Converting Industry *Lance Cullen, Madico*	Increased Adhesion On Web Substrates *Jim DiBattista, Darly Custom Technology*	Optimizing Tension Control Performance In Center Driven Winders *William Gilbert, Siemens Industry, Inc.*
9:00 AM - 10:00 AM	Spouse/Guest Networking Event (Optional) LOCATION: Atlantic 4 & 5		
9:30 AM	Problem-Solving Techniques For Use In A Lean Environment *Peter Koch, ABBA Roller*	Rate Of Growth Of Oxide Layers On Metal Films Deposited On Plastic Film Substrates *Don McClure, Acuity Consulting and Training*	Drive Response Requirements For Web Handling *Clarence Klassen, KlassEngineering*
10:00 AM	BREAK		

	LOCATION: North Hall		
Sessions:	New Materials For Functional Coatings	System And Process Developments	Web Conveyance I *Session Leader: David Roisum*
10:30 AM	Advances In Water Based High Barrier Nanocomposite Coatings And Laminates *Harris A. Goldberg, InMat, Inc.*	Advancing Technology For Security Applications Beyond Roll-To-Roll Vacuum Coating *Kees-Jan Delst, Director Science and Technology, JDSU Advanced Optical Technology Segment, Flex Products Group*	New Functionalities From Air Bearings Acting On Films *Tim Claffey, New Way Air Bearings*
11:00 AM	Graphene Based Inks And Coatings For Printed Electronics And Coated Conductives *Sanjay Monie, Vorbeck Materials*	Maximizing The Potential Of Rotatable Magnetron Sputter Sources For Web Coating App's *Dermot Monaghan, Gencoa*	Getting And Losing Traction *Jerry Brown, Essex Systems*
11:30 AM	Conductive Polymer Films And Invisible Patterning Techniques For Transparent Electrode Applications *Ron Lubianez, Heraeus Precious Metals North America Conshohocken LLC*	High Speed Solid State Laser Inspection Of Flexible Substrates *Tim Potts, Dark Field Technologies*	Wrinkling Of Foils *Tim Walker, TJ Walker & Associates, Inc.*
12:00 PM - 1:00 PM	LUNCH LOCATION: Atlantic 4 & 5		
Sessions:	Process Improvements *Session Leaders: Mike Sellers, Ron Lubianez*	Barrier *Session Leaders: Andy Jack, Pat Higgins*	Rollers *Session Leader: Tim Walker, Jerry Brown*
1:00 PM	Engineered Elastomeric Materials *Devin Frost, ABBA Roller*	Transparent Barrier Coatings For Environmentally-Friendly Packaging Applications *Roland Trassl, Applied Materials*	Roller Alignment - Standards *David R Roisum, Finishing Technologies, Inc.*
1:30 PM	Laminator Static Control *Kelly Robinson, Electrostatic Answers*	AlOx Barrier Layers On Poylmer Web *Carolin Struller, GVE & MMU, GVE Ltd*	Guidelines For Idler Rollers For Web Handling *Duane Smith, Davis-Standard, LLC*
2:00 PM	Process Optimization & Order Quality Traceability Using A Real-Time Data Acquisition & Management Network *Joe Martin, Qualitek Solutions, Inc*	Multi-Layer High Barrier Packaging - Simplify The Packaging Structure For A Sustainable Approach *TBD, Taghleef*	Roller Alignment - Mechanics *David R Roisum, Finishing Technologies, Inc.*
2:30 PM	Industrial Digital Printing For The Converting Industry *Dene Taylor, Specialty Papers & Films, Inc*	Barrier Properties Enhanced With Pulsed Dc Magnetron Plasma Pre-Treatment For Packaging Films In R2R Metalizers. *Anye Chifen, Leybold Optics*	Thermal Spray Technology For The Printing & Converting Industries *John A Bonar, Materials & Process Technology*
3:00 PM	BREAK LOCATION: North Hall		
Sessions:	Intellectual Property	System Developments	Web Conveyance II
3:30 PM	So, Should We Patent That? *Kelly Robinson, Electrostatic Answers*	Pass Though Vacuum Chambers For Research And Production *Tim Claffey, New Way Air Bearings*	Butt Splice Hinging *Kevin Cole, Optimation Technology*

4:00 PM	The ROI Of IP *Mark D. Miller, Coating Tech Service, LLC*	Modern Vacuum Pumping Systems And Services Of Oerlikon Leybold Vacuum *Mike Ridenour, Oerlikon Leybold Vacuum*	The Negative Impact Of Uneven Calendering On Web Properties And Strength *Frederic Parent, FPInnovations*
4:30 PM	Patent Law Changes From The Americans Invents Act *Devan Padmanabhan, Winthrop and Weinstine*	Investigation Of Gas Gate Isolation With Roll-To-Roll VHF PECVD System *Chih-Pong Huang, Physics Div, Inst of Nuclear Energy Research*	Measuring Nip Pressure And Footprint *Stefan Wegdell, Nip Control*
5:00 PM - 7:00 PM	TableTop Reception LOCATION: Atlantic 4 & 5		
7:00 PM - 8:00 PM	John Reading Memorial Scotch Tasting (Optional) LOCATION: Tides 1 & 2		
Tuesday, October 23, 2012			
Tracks:	Web Coating & Laminating LOCATION: Atlantic 6 - 8	Vacuum Web Coating LOCATION: Atlantic 1- 3	Web Handling LOCATION: Oleander Ballrm
6:00 AM	Bernard Henry 5K Fun Run (Optional) LOCATION: Meet In Lobby		
7:00 AM - 9:00 AM	BREAKFAST LOCATION: Atlantic 4 & 5		
Sessions:	Coating Technology *Session Leaders: Ken McCarthy, Peter Koch*	Measurement And Modelling *Session Leaders: Don McClure, Anye Chifen*	Winding And Splicing *Session Leader: William Gilbert, Clarence Klassen*
7:55 AM	Announcements	Announcements	Announcements
8:00 AM	Methods And Design Considerations For The Application Of Hot Melt Coatings *Bob Pasquale, New Era Converting Machinery, Inc.*	In-Line Pin Hole Detection - Hawkeye *Nick Copeland, General Vacuum Equipment*	Reducing Roll Faults Caused By Thickness Non-Uniformity *Dilwyn Jones, Emral Ltd*
8:30 AM	Intermittent Coating: A Comparison Of Three Methods *Eric Maki, MEGTEC Systems, Inc.*	Magnetic Field Strength As A Variable In Optimizing Magnetron Sputtering Processes *Francisco J. Jimenez, Smith and Nephew (Alberta) Inc.*	Guidelines For Selecting The Best Winding Process *Duane Smith, Davis-Standard, LLC*
9:00 AM	Something Relevant In Coating Heads Technology: Single Roller, 5 Rollers System And Everything In Between *Giancarlo Caimmi, Nordmeccanica*	Heat Load Variations On Web Substrates As Seen By Deposition Modelling *Mike McCann, CAB Consult & McCann Science*	Static Myth: That Roll Charged-Up On The Truck *Kelly Robinson, Electrostatic Answers*
9:30 AM	From Curtain Coating To Bead Mode Slot Die Coating - Contact Free Coating Procedures For Thin Functional Coating Layers *Jens Vollpott, KROENERT GmbH & Co KG*	HiBarSens: Tunable Diode Laser Spectroscopy For Ultra Barrier Measurement *Harald Beese, Fraunhofer IWS*	Wireless Monitoring Of Winding Roll Pressures *Tim Walker, TJ Walker & Associates, Inc. / Tekscan*
10:00 AM	BREAK LOCATION: North Hall		
Sessions:	Opportunities For Reducing Costs	Process Materials	Sage On Stage *Session Leader: Ken Guhse*

10:30 AM	Optimizing Coating Costs *Larry Gogolin, Gogolin & Associates*	Low Temperature HiTUS Deposition Of In4Sn3O12 Onto Polymer Substrates For Flexible Electronics Applications *Phillip Butler, Dept of Matls, U of Oxford*	Sage On Stage *Dr. Dilwyn Jones, Emral Ltd.* *Clarence Klassen, KlassENgineering* *Dr. David Roisum, Finishing Tech.* *Tim Walker, TJWalker & Associates* *Jerry Brown, Essex Systems*
11:00 AM	Acoustic Drying Technology - Case Studies Coating Applications *Gene Plavnik, Heat Technologies, Inc.*	Sputtered ITO For Touch Panel App's Using Rotary Ceramic Targets *Paul Lippens, UMICORE Thin Film Products*	Sage On Stage (Continued)
11:30 AM	Best Practices...Achieving Sustainability And Zero-Landfill Goals (Case Study Approach) *Mike O'Steen, Nexeo Solutions, LLC*	The Future Of Indium Supply And ITO *William Jackson, Indium Corporation*	Sage On Stage (Continued)
1:00 PM - 5:00 PM	Networking Event: Golf (Optional)		
6:30 PM - 7:30 PM	Keynote: The Secret Life Of Water: E = H2O < LOCATION: Atlantic 6 - 8 *Gerald H. Pollack, University of Washington, Seattle*		
Wednesday, October 24, 2012			
Tracks:	Web Coating & Laminating LOCATION: Atlantic 6 - 8	Vacuum Web Coating LOCATION: Atlantic 1- 3	
7:00 AM - 9:00 AM	BREAKFAST LOCATION: Atlantic 4 & 5		
Sessions:	Coatings And Treatments *Session Leaders: Doug Krasuki, Steve Huff*	Impact Technologies *Session Leaders: Richard Swisher, Joe Papalia*	
7:55 AM	Announcements	Announcements	
8:00 AM	Flame Treatment Technology And Its Last Developments *Stefano Mancinelli, esseCI srl*	Roll-To-Roll Deposition Of ITO Film On A Flexible Glass Substrate *Yoshimitsu Ikari, Kobe Steel*	
8:30 AM	Effect Of Control Release Additives On Peel Release Values Of Silicone Liners *Igor V. Khudyakov, Solutia Inc. Performance Films*	R2R Device Fab On Flex Glass *Sean Garner, Corning*	
9:00 AM	Emulsion Silicones And CCK - The Building Blocks For Specialty Release Papers *W Michael Reed, Glatfelter*	Comparison Of Roll-To-Roll Deposited ITO On Flexible Glass, PEN And PET *James C Switzer III, CAMM/Binghamton University*	
9:30 AM	Combining Polypropylene With Aluminum Foil *Bruce Foster, Mica Corporation*	Invisible ITO: A Novel Approach To Making Something That Everyone Wants, Everyone Uses And Nobody Can See. *Tom Faris, Vampire Optical Coatings, Inc*	
10:00 AM	BREAK LOCATION: North Hall		

Sessions:	On Line Gauging And Inspection	Impact Technologies *Session Leaders:*	
10:30 AM	Beyond Defect Detection- Process Monitoring For Coated Materials With EasyMeasure *Jochen Koenig, Schenk Vision/Dr.Schenk*	Roll-To-Roll ALD Prototype For 500 Mm Wide Webs *Tapani Alasaarela, Beneq*	
11:00 AM	Latest Developments And Concepts In Optical Web Coating Inspection Technologies *Brian Heil, ISRA VISION*	Development Of Conductive Polymer Film And R2R Coating Process *Nizamidin Jappar, Kimoto Tech Inc*	
11:30 AM	Non-Nuclear Non Contact Weight Measurement With Ultrasonic *Bill Scala, Erhardt-Leimer*	Printed Electronics - TBD *Wolfgang Decker, Vast Films, Ltd.*	
12:00 PM - 1:00 PM	LUNCH LOCATION: Atlantic 4 & 5		
Sessions:	Roll-To-Roll Market Overview Presentations	Application Issues *Session Leaders: Charles Bishop, John Fenn*	
1:00 PM	Release Liner Market Review *Corey Reardon, Alexander Watson Associates*	Thin Film Coatings- Material Interactions With Solar Energy *Mike Martin, Saint-Gobain*	
1:30 PM	The Current State And Future Outlook For The Global Flexible Packaging Market *Paul Gaster, PCI Films Consulting Ltd.*	Back And Front Contacts For Flexible CIGS Applications *Torsten Winkler, FHR Anlagenbau GmbH*	
2:00 PM	Label Market Review *Jackie Marolda, Alexander Watson Associates*	The Trojan Horse Principle In Wound Management: A Challenge For Upscaling *Renate Foerch, Max Planck Institute*	
2:30 PM	Metallizing Market Review *William Llewellyn, Alexander Watson Associates*	Hi Barrier Metallized Film Manufacture: The Substrate/Surface Treatment/Vacuum Process Interaction *Eldridge M Mount III, EMMount Technologies*	
3:00 PM	BREAK LOCATION: North Hall		
Sessions:		Substrates	
3:30 PM	Thin-Film Battery And Ultracapacitor R2R Manufacturing *Anthony Sudano, Sudano Consulting, Inc.*	Flexible Substrates For Vacuum Coating *Charles A Bishop, C.A.Bishop Consulting Ltd.*	
4:00 PM	Global Markets For Solar Products *Paula Mints, Navigant Consulting, Inc.*	Super Hydro & Oleophobic Finish For Woven & Non-Woven Textiles *TBD, Sigma Tech*	
4:30 PM		Recent Improvements In PET For Flexible Electronics And	

		Photovoltaic Applications *Jan S LaRiviere, DuPont Teijin Films*	
5:00 PM - 7:00 PM	Farewell Reception / Matteucci Technical Award LOCATION: Courtyard		

2012 Web Coating Handling Conference Preliminary Attendee List
(as of 10/25/12)

附件一

Organization	First Name	Last Name	Guest	City	State	Country
ABBA Roller, LLC	Bob	Cooke		Ontario	CA	United States
ABBA Roller, LLC	Frank	Espelin	Janine Espelin	Ontario	CA	United States
ABBA Roller, LLC	Devin	Frost		Ontario	CA	United States
ABBA Roller, LLC	Peter	Koch		Ontario	CA	United States
Acucote Inc.	Jason	Lamb		Graham	NC	United States
Acuity Consulting and Training	Don	McClure	Jodie McClure	Siren	WI	United States
Adchem Corporation	Frank	Dailey		Riverhead	NY	United States
Adhesives Research, Inc.	Doug	Goldstein		Waxhaw	NC	United States
Adhesives Research, Inc.	Bill	Stratton		Glen Rock	PA	United States
Advance Systems, Inc.	Kevin	Bujnis		Green Bay	WI	United States
Advance Systems, Inc.	Mike	Sellers		West Chicago	IL	United States
Aegis Films	Keith	Dalton		Stanleytown	VA	United States
AIMCAL	Steve	Bright		Fort Mill	SC	United States
AIMCAL	Erin	Davis		Fort Mill	SC	United States
AIMCAL	Tracey	Ingram		Fort Mill	SC	United States
AIMCAL	Craig	Sheppard		Fort Mill	SC	United States
Applied Materials	Liz	Josephson		Alzenau	Bavaria	Germany
Applied Materials	Christof	Kurthen		Alzenau	Bavaria	Germany
Applied Materials	Roland	Trassl		Alzenau	Bavaria	Germany
Ashland Performance Materials	Cathleen	Boysko	Eric Boysko	Dublin	OH	United States
Ashland Performance Materials	Cindy	Fruth		Dublin	OH	United States
Ashland Performance Materials	Tom	McKone		Leland	NC	United States
Ashland Performance Materials	Rick	Stokes		Dublin	OH	United States
Atlas Converting North America	Brian	Stiff		Charlotte	NC	United States
AWA Alexander Watson Associates	Jackie	Marolda		Chicago	IL	United States
AWA Alexander Watson Associates BV	Corey	Reardon		Amsterdam		Netherlands
Bakish Material Corporation	Robert	Bakish	Ellen Bakish	Englewood	NJ	United States
BASF Corporation	Limei	Lu		Wyandotte	MI	United States
BASF Corporation	Sandra	Mateus		Fort Mill	SC	United States
BASF Corporation	Casper	Mullertz		Newport	DE	United States
Beneq	Tapani	Alasaarela		Vantaa		Finland
Binghamton University	Jim	Switzer		Binghamton	NY	United States
Bobst - General Vacuum Equipment Ltd.	Greg	Tullo		Raleigh	NC	United States
Bobst Group North America	Frank	Passarelli		Moon Twshp	PA	United States
Bobst Manchester	Nick	Copeland		Heywood	LANCASHIRE	United Kingdom
Bobst Manchester	Andrew	Jack		Heywood	LANCASHIRE	United Kingdom

2012 Web Coating Handling Conference Preliminary Attendee List
(as of 10/25/12)

Organization	First Name	Last Name	Guest	City	State	Country
Bobst Manchester	Darren	Pickford		Heywood	LANCASHIRE	United Kingdom
Bostik, Inc.	Ben	Huang		Wauwatosa	WI	United States
Brady Worldwide, Coated Products	Eric	Maercklein	Peggy Maercklein	Milwaukee	WI	United States
Bryce Corporation	Mark	Montsinger		Memphis	TN	United States
Bryce Corporation	Mike	Williams		Memphis	TN	United States
C.A.Bishop Consulting Ltd	Charles	Bishop		Nr. Loughborough	Leicestershire	United Kingdom
Camvac Limited	David	Anthony		Norfolk	Thetford	United Kingdom
Carestream Tollcoating	Richard	Daniels		Windsor	CO	United States
Carestream Tollcoating	Kirk	Hansen		Windsor	CO	United States
Carestream Tollcoating	Jason	Payne		Windsor	CO	United States
Cascades Sonoco	Odes	Wilemon		Birmingham	AL	United States
Celplast Metallized Products	Nowrin	Abedin		Toronto	ON	Canada
Celplast Metallized Products	Sid	Fernandes		Toronto	ON	Canada
Celplast Metallized Products	Dante	Ferrari		Toronto	ON	Canada
Celplast Metallized Products	Bill	Hellings	Inga Hellings	Toronto	ON	Canada
Celplast Metallized Products	Chuck	Larsen	Else Pedersen	Toronto	ON	Canada
Ceramatec, Inc.	Jonathan	Clark		Salt Lake City	UT	United States
Ceramatec, Inc.	Brent	Fresz		Salt Lake City	UT	United States
Circonix Technologies	Paul	Bilotti		Ringwood	NJ	United States
Clean Room Coating Solutions	Kenneth	McCarthy		Duxbury	MA	United States
Coating and Laminating Sales	William	Yoder	Alys Yoder	Boonton	NJ	United States
Coating Materials (Division of Tico Titanium, Inc.)	Lance	Sides		Wixom	MI	United States
Coating Tech Service	Mark	Miller		Minneapolis	MN	United States
ConQuip Inc.	Derek	Mainstone		Rancho Cordova	CA	United States
Converting Quarterly	Mark	Spaulding		Pleasant Prairie	WI	United States
Converting Quarterly / Peterson Publishing	Rebecca	Arensdorf		Topeka	KS	United States
Converting Quarterly / Peterson Publishing	Cindi	Stocker		Topeka	KS	United States
Cork Industries, Inc.	Clarence	Miller	Colleen Miller	Folcroft	PA	United States
Corning Incorporated	Sean	Garner		Corning	NY	United States
Corning Incorporated	Gene	Smith		Hickory	NC	United States
Dark Field Technologies	Timothy	Potts		Orange	CT	United States
Darly Custom Technology Inc.	Jim	DiBattista		Windsor	CT	United States
Davis-Standard Converting Systems	Chuck	Hubbard	Jill Hubbard	Fulton	NY	United States
Davis-Standard Converting Systems	Duane	Smith	Becky Smith	Fulton	NY	United States
Deposition Technology Innovations (DTI)	Jerry	Noblin	Cindy Noblin	Jeffersonville	IN	United States
Deposition Technology Innovations (DTI)	Joe	Papalia		Jeffersonville	IN	United States

2012 Web Coating Handling Conference Preliminary Attendee List
(as of 10/25/12)

Organization	First Name	Last Name	Guest	City	State	Country
Deposition Technology Innovations (DTI)	Paolo	Raugei	Seien Raugei	Alpharetta	GA	United States
Dow Chemical Company	Tom	Bartosz		Buffalo Grove	IL	United States
Dow Chemical Company	Kelley	Klein		Buffalo Grove	IL	United States
DUNMORE Corporation	Patrick	Anglim		Bristol	PA	United States
DUNMORE Corporation	Glenn	Musse		Bristol	PA	United States
DuPont Teijin Films	Bob	Burgess	Debbie Burgess	Lancaster	SC	United States
DuPont Teijin Films	Jan	LaRiviere		Chester	VA	United States
Eastman	Sergio	Luna		Los Gatos	CA	United States
Eastman	Rocky	Fizzano		Fieldale	VA	United States
Eastman	Igor	Khudyakov	Irina Khudyakov	Fieldale	VA	United States
Eastman	Andres	Vasquez		Fieldale	VA	United States
Eastman	Steve	Barth	Sandee Barth	Fieldale	VA	United States
Eastman	Shannon	Dowdy		Fieldale	VA	United States
Eastman	Michael	Hawkins	Sarah Hawkins	Fieldale	VA	United States
Edward D Cohen Consulting	Edward	Cohen		Fountain Hills	AZ	United States
Electronic Systems, USA	Michael	Cunningham		Lee's Summit	MO	United States
Electrostatic Answers, LLC	Kelly	Robinson		Rochester	NY	United States
EMMOUNT Technologies	Eldridge	Mount	Nancy Mount	Canandaigua	NY	United States
Emral Ltd.	Dilwyn	Jones		Yarm	Cleveland	United Kingdom
Enercon Industries Corporation	Rory	Wolf		Menomonee Falls	WI	United States
entrotech, inc	Jim	Cachat		Columbus	OH	United States
entrotech, inc	Shawn	Freer		Columbus	OH	United States
Erhardt + Leimer, Inc.	Bill	Scala		Duncan	SC	United States
esseCI srl	Stefano	Mancinelli		Narni		Italy
Essex Systems	Jerry	Brown		Huntington	NY	United States
Ester Industries	BN	Gupta		Haryana		India
Exopack Advanced Coatings	Gregory	Williams		Matthews	NC	United States
Extrusion Dies Industries, LLC	Matt	Frisinger		Chippewa Falls	WI	United States
Extrusion Dies Industries, LLC	Dave	Kuenne		Chippewa Falls	WI	United States
Extrusion Dies Industries, LLC	Tim	Marion		Chippewa Falls	WI	United States
Extrusion Dies Industries, LLC	Nathan	Rich		Chippewa Falls	WI	United States
Extrusion Dies Industries, LLC	Dan	Schueler		Chippewa Falls	WI	United States
ExxonMobil Chemical	George	Cretekos		Macedon	NY	United States
ExxonMobil Chemical	Raj	Verghese		Macedon	NY	United States
Faustel, Inc.	Chris	Clark		Germantown	WI	United States
Faustel, Inc.	Jay	Totten		Germantown	WI	United States

2012 Web Coating Handling Conference Preliminary Attendee List
(as of 10/25/12)

Organization	First Name	Last Name	Guest	City	State	Country
Faustel, Inc.	Jeff	Wold		Germantown	WI	United States
Fennagain	John	Fenn		West Hills	CA	United States
FHR Anlagenbau GmbH	Stella	Maris van Eek		Ottendorf-Okrilla		Germany
FILMtech, Inc.	Keith	Stansberry	Sherry Stansberry	Bean Station	TN	United States
Finishing Technologies, Inc.	David	Roisum		Neenah	WI	United States
Finzer Roller	Randy	Apperson		Des Plaines	IL	United States
Finzer Roller	Clyde	Evans		Indianapolis	IN	United States
Finzer Roller	Dave	Finzer		Des Plaines	IL	United States
Finzer Roller	Greg	Williard		Des Plaines	IL	United States
FLEXcon	Michael	Engel	Sue Engel	Spencer	MA	United States
Fortress Optical Features	Greg	Collins		Thurso	QC	Canada
Fortress Optical Features	Denis	Vendette	Jane Gravel	Thurso	QC	Canada
Fox River Associates	Duncan	Wall	Nancy T. Wall	Geneva	IL	United States
FPInnovations / Paprican	Frederic	Parent		Pointe-Claire	QC	Canada
Franklin Adhesives and Polymers	Jim	Herring		Columbus	OH	United States
Franklin Adhesives and Polymers	Norb	Stawicki		Columbus	OH	United States
Fraunhofer IWS	Harald	Beese		Dresden		Germany
Fusion UV Systems, Inc.	Kevin	Joesel		Gaithersburg	MD	United States
Gencoa	Dermot	Monaghan		Liverpool		United Kingdom
General Atomics Aeronautical	Kirk	Norton		San Diego	CA	United States
GfE Materials Technology Inc	David	Preische		Wayne	PA	United States
Glatfelter	W. Michael	Reed		Friedens	PA	United States
Gogolin & Associates	E. Lawrence	Gogolin	Cinnie Brown	Bolton	MA	United States
Great Northern Corp	Chris	Steffen		Oshkosh	WI	United States
Harper Corporation of America	Greg	Harms		Charlotte	NC	United States
Harper Corporation of America	Alan	Rogers		Charlotte	NC	United States
Hazen Paper Co.	Tim	McDonald	Kathleen McDonald	Holyoke	MA	United States
Heat Technologies, Inc.	Glenn	Emory		Peachtree City	GA	United States
Henkel Corporation	Ingrid	Brase		Bridgewater	NJ	United States
Henkel Corporation	Tim	Golden		Springfield	MA	United States
Heraeus Materials Technology LLC, Conductive Polymers Division	Ron	Lubianez		Fitchburg	MA	United States
Honeywell Healthcare & Packaging	Ken	Guhse		Monroe	NC	United States
ICE / Mack Brooks Exhibitions Inc.	Bob	Chiricosta		Burlington	MA	United States
Imperial Rubber Products	Steve	Huff		Chino	CA	United States
Indium Corporation	William	Jackson		Clinton	NY	United States
InMat, Inc.	Harris	Goldberg		Hillsborough	NJ	United States

2012 Web Coating Handling Conference Preliminary Attendee List
(as of 10/25/12)

Organization	First Name	Last Name	Guest	City	State	Country
Institute of Nuclear Energy Research	Dr. Chih-Pong	Huang		Taipei		Taiwan
INTEGRITY Roller Services	Leslie	McDonald		Orange	CA	United States
ISRA Surface Vision	Brian	Heil		Duluth	GA	United States
ITW Covid	Rebecca	Bell		Cranbury	NJ	United States
JDSU-Flex Products Group	Kees-Jan	Delst		Santa Rosa	CA	United States
Johnson Laminating and Coating, Inc.	Scott	Davidson		Carson	CA	United States
Johnson Laminating and Coating, Inc.	John	McLeod		Carson	CA	United States
Kennametal Sintec	Chris	Decker		Goshen	NY	United States
Kennametal Sintec USA	Rob	Lattimer		Wilton	CT	United States
Kimoto Tech, Inc.	Nizamidin	Jappar		Cedartown	GA	United States
KlassENgineering	Clarence	Klassen	Christine Klassen	Peterboro	ON	Canada
Kobe Steel, LTD.	Ikari	Yoshimitsu		Takasago	HYOGO	Japan
Kriya Materials	Edwin	Currie		Geleen	Limburg	Netherlands
Kroenert	Bob	Dages		Kenosha	WI	United States
Kroenert	Daniel	Eggerath		Hamburg		Germany
Kroenert	Jens	Vollpott		Hamburg		Germany
Kurt J. Lesker Co. Inc.	Bart	Merritt		Clairton	PA	United States
Leybold Optics GmbH	Anye	Chifen		Alzenau	BY	Germany
Leybold Optics USA, Inc.	Rafael	Becerra		Cary	NC	United States
Leybold Optics USA, Inc.	Tom	Finnerty		Cary	NC	United States
Leybold Optics USA, Inc.	George	Kim		Cary	NC	United States
Leybold Optics USA, Inc.	Jennifer	Misenheimer		Cary	NC	United States
Leybold Optics USA, Inc.	Antonio	Requena		Cary	NC	United States
Leybold Optics USA, Inc.	Oscar	Silio		Cary	NC	United States
LG Hausys	Jung (Alex)	Cho		Gyeonggi-do		Korea
Lockheed Martin	Bill	Ng		Palmdale	CA	United States
LTS Lohmann Therapy Systems Corp.	Kenneth	Glade		West Caldwell	NJ	United States
M&PT	John	Bonar				United States
Madico, Inc.	Lance	Cullen		Woburn	MA	United States
Madico, Inc.	David	Fletcher	Carol Fletcher	St. Petersburg	FL	United States
Manchester Metropolitan University	Carolin	Struller		Manchester		United Kingdom
Materion Large Area Coatings	Peter	Asiello		Windsor	CT	United States
Materion Corp.	Jonathon	Wilson		Windsor	CT	United States
MeadWestvaco	David	Knox		Richmond	VA	United States
MEGTEC Systems Inc.	Dan	Bemi		De Pere	WI	United States
MEGTEC Systems Inc.	Eric	Maki		De Pere	WI	United States

2012 Web Coating Handling Conference Preliminary Attendee List
(as of 10/25/12)

Organization	First Name	Last Name	Guest	City	State	Country
Menges Roller Company	Matthew	Menges	Dixie Menges	Wauconda	IL	United States
Mica Corporation	Bruce	Foster	Lynn Kripe	Shelton	CT	United States
Michelman	Ginger	Cushing		Cincinnati	OH	United States
Midwest Engineering	Steve	Bougie		Pewaukee	WI	United States
Midwest Engineering	Peter	Stelling		Pewaukee	WI	United States
Mitsubishi Materials	Naoki	Rikita		Tokyo		Japan
Mitsubishi Materials	Travis	Timian		Fountain Valley	CA	United States
MJMcCann-Consulting	Michael	McCann		Chadds Ford	PA	United States
MOCON, Inc.	April	Gambrell		Minneapolis	MN	United States
MTI & Polyexe Corporation	Michael	Sullivan	Sarah Boss-Sullivan	Cape Elizabeth	ME	United States
Mx Plnck Institute for Polymer Research	Renate	Förch		Mainz		Germany
NDC Infrared Engineering	Dave	Atkinson		Irwindale	CA	United States
NDC Infrared Engineering	Hector	Marchand		Irwindale	CA	United States
New Era Converting Machinery, Inc.	Paul	Lembo		Hawthorne	NJ	United States
New Era Converting Machinery, Inc.	John	Looser		Hawthorne	NJ	United States
New Era Converting Machinery, Inc.	Robert	Pasquale		Hawthorne	NJ	United States
New Way Air Bearings	Tim	Claffey		Aston	PA	United States
Nexeo Solutions	Mike	O'Steen		Dublin	OH	United States
Nip Control	Stefan	Wegdell		Saltsjobaden		Sweden
Nordmeccanica NA Ltd	Steven	Lekan		Edgewood	NY	United States
NSC USA Inc.	Amaury	de Laforcade		Fort Mill	SC	United States
nTact	Robbie	Charters		Dallas	TX	United States
Oerlikon Leybold Vacuum	Mike	Ridenour		Export	PA	United States
Olbrich Machinery	Gunter	Roesler		Bocholt		Germany
Optimation Technology, Inc	Kevin	Cole		Rochester	NY	United States
Optimation Technology, Inc	Kurt	Hardenbrook		Rochester	NY	United States
PFFC - Paper, Film & Foil Converter	Yolanda	Simonsis		Chicago	IL	United States
Pillar Technologies, an ITW Company	Robert	Hablewitz		Hartland	WI	United States
Precision Coatings Inc.	Steve	Sedlak		Walled Lake	MI	United States
Pres-On	John	Starkey		Bolingbrook	IL	United States
Printpack Inc.	Bill	Barlow		Villa Rica	GA	United States
Qualitek Solutions	Joe	Martin		Tucker	GA	United States
R.D. Specialties, Inc.	Douglas	Krasucki		Webster	NY	United States
Rayven Inc.	Joe	Heinemann		Saint Paul	MN	United States
Roll Technology Corp.	David	Johnston		Greenville	SC	United States
Rol-Vac, LP	Stephen	Duff		Dayville	CT	United States

2012 Web Coating Handling Conference Preliminary Attendee List
(as of 10/25/12)

Organization	First Name	Last Name	Guest	City	State	Country
Rol-Vac, LP	Ron	Jones		Dayville	CT	United States
Rotadyne	Ed	Sahli		Louisville	KY	United States
Rotadyne	Brian	Willard		Greensboro	NC	United States
Saiden Technologies	Frank	Jennings		Newtown	PA	United States
Saint-Gobain Performance Plastics	Michael	Martin	Christine Martin	San Diego	CA	United States
Schenk Vision	Jochen	Koenig		Woodbury	MN	United States
Schenk Vision	Larry	Sheets	Mihoko Sheets	Woodbury	MN	United States
Schmid Vacuum Technology GmbH	Gerard	Loebig		Karlstein	Bavarya	Germany
Schmid Vacuum Technology GmbH	Peter	Sauer		Karlstein	Bavarya	Germany
Sensory Analytics, LLC	Greg	Frisby	Deidre Frisby	Greensboro	NC	United States
ShapedWire / Solon Specialty Wire	Jan	Deruytter		Solon	OH	United States
ShapedWire / Solon Specialty Wire	Kevin	Sopczak	Maria Sopczak	Solon	OH	United States
Shurtape Technologies, LLC	Ben	Dibble		HICKORY	NC	United States
Shurtape Technologies, LLC	Robert	Young		HICKORY	NC	United States
Siemens Industry, Inc.	William	Gilbert		Norcross	GA	United States
Sigma Technologies International, Inc.	Chris	Hohmann		Tucson	AZ	United States
Sigma Technologies International, Inc.	Angelo	Yializis		Tucson	AZ	United States
SKC Inc.	Tom	Gray		Covington	GA	United States
SKC Inc.	Brett	Johnson		Covington	GA	United States
SKC Inc.	Sam	Nasser		Covington	GA	United States
SKC Inc.	Jun	Yoon		Covington	GA	United States
SK innovation	YunBong	Kim		Daejeon		Korea
SK innovation	Yeongmin	Jo		Daejeon		Korea
Smith & Nephew (Alberta) Inc	Francisco	Jimenez		Fort Saskatchewan	AB	Canada
Solar Gard Saint-Gobain	Chris	Gauthier		San Diego	CA	United States
Solar Gard Saint-Gobain	Gary	Phillips		San Diego	CA	United States
Solutia's Performance Films Division	Frances	Schantz		Martinsville	VA	United States
Sonoco Products Company	Scott	Huffer		Hartsville	SC	United States
Sonoco Products Company	Pete	Papajohn		Greer	SC	United States
Sonoma Photonics	Michael	Robbins		Santa Rosa	CA	United States
Sonoma Photonics	Byron	Wood		Santa Rosa	CA	United States
Specialty Papers & Films, Inc.	Dene	Taylor		New Hope	PA	United States
Sputtering Components Inc.	Sarah	Williams		Livermore	CA	United States
Sudano Consulting Inc.	Anthony	Sudano		Laval	QC	Canada
Sung An Machinery Company, LTD.	Ed	Lincoln		East Amherst	NY	United States
Surface Optics Corp.	Sam	Dummer		San Diego	CA	United States

2012 Web Coating Handling Conference Preliminary Attendee List
(as of 10/25/12)

Organization	First Name	Last Name	Guest	City	State	Country
Swisher & Assoc.	Richard	Swisher		Northfield	MN	United States
Taghleef Industries USA – AET	Chris	Trummel		Wilmington	DE	United States
TANN Corporation	Dale	Borchardt	Sandra Borchardt	Kaukauna	WI	United States
Tekra Corporation	Dan	Blair		New Berlin	WI	United States
Tekra Corporation	Anthony	Janke		New Berlin	WI	United States
Tekra Corporation	Jason	Wichmann		New Berlin	WI	United States
Terphane Inc.	Dan	Roy		Bloomfield	NY	United States
tesa tape, inc.	Tom	Dupont		Sparta	MI	United States
tesa tape, inc.	John	Fox		Sparta	MI	United States
tesa tape, inc.	Joerg	Mahn		Charlotte	NC	United States
The University of Washington	Gerald	Pollack	Emily Freedman	Seattle	WA	United States
The University of York	Yvette	Hancock		York		United Kingdom
TJ Walker & Associates, Inc.	Tim	Walker		St. Paul	MN	United States
Toray Plastics (America) Inc.	Bonnie	Adams		North Kingstown	RI	United States
Toray Plastics (America) Inc.	Chris	Curry		North Kingstown	RI	United States
Toray Plastics (America) Inc.	Mike	Narkevicius		North Kingstown	RI	United States
Toray Plastics (America) Inc.	Tracy	Paolillli		North Kingstown	RI	United States
UMICORE Thin Film Products	Paul	Lippens		Olen	Vlaanderen	Belgium
UMICORE Thin Film Products	Fezan	Sayed		Providence	RI	United States
University of Oxford, Department of Materials	Phillip	Butler		Oxford	Oxon	United Kingdom
UPM Raflatac, Inc.	Simon	Chivers		Mills River	NC	United States
Vacuum Depositing Inc.	David	Bryant		Louisville	KY	United States
Vampire Optical Coatings, Inc.	Tom	Faris		Kirkersville	OH	United States
Vast Films, Ltd.	Wolfgang	Decker		Darlington	PA	United States
Vetaphone	Kevin	McKell		Chicago	IL	United States
von Ardenne Anlagentechnik GmbH	Holger	Pröhl		Dresden		Germany
von Ardenne Anlagentechnik GmbH	Christian	Perplies		Dresden		Germany
von Ardenne Anlagentechnik GmbH	Falk	Otto		Dresden		Germany
von Ardenne Anlagentechnik GmbH	Michael	Hentschel		Dresden		Germany
Vorbeck Materials	Sanjay	Monie		Jessup	MD	United States
Web Systems, Inc.	George	Zuments		Broomfield	CO	United States
Winthrop and Weinstine	Devan	Padmanabhan		Minneapolis	MN	United States
Wintriss Engineering Corporation	Peter	Burggren		San Diego	CA	United States
Worthen Industries	Fran	Mussatti		Isle of Palms	SC	United States
Yeagle Technology Inc.	Brian	Savulis	Patricia Savulis	Ashford	CT	United States