經濟部幕僚單位及行政機關人員從事兩岸交流活動報告書

出席
The Eleventh International Conference on High-Performance Ceramics (CICC-11)
國際研討會

研討會議報告

研提人單位　：國立臺北科技大學

職稱　：計畫主持人、協同主持人

姓名　：鄭大偉 教授、李韋皞 博士

參 訪 期 間：2019 年 05 月 25 日至 2019 年 05 月 30 日

報 告 日 期：2019 年 06 月 12 日

（本報告請檢送 1 式 3 份）

政府機關（構）人員從事兩岸交流活動（參加會議）報告

壹、 交流活動基本資料

一、活動名稱：The Eleventh International Conference on High - Performance Ceramics (CICC-11)

二、活動日期：2019 年 5 月 25 日至 5 月 29 日，共計 5 日。

三、主辦單位：中國硅酸鹽學會

四、報告撰寫人服務單位：國立臺北科技大學.

貳、 活動（會議）重點

一、 活動性質

本研討會係由中國硅酸鹽學會所主辦，為 2 年一次之世界級著名國際研討會，本次參與之專家學者來自全球各地，包含:美國、德國、義大利、日本、澳洲、韓國、台灣、中國大陸…等，總計超過 600 名教授學者進行成果發表，大會發表主題類別超過 25 項，全場發表文章超過 1400 篇次，可謂相當盛大。研討會內容包含:先進陶瓷材料、磁性陶瓷材料、3D 列印陶瓷材料、生醫陶瓷材料….等，其中包含[Ecofriendly Geopolymer and Geopolymer-Developed Ceramics]此項主題，與本研究案實屬同類型研究方向，因此於此會議議程中進行報告時，不僅能向國際專家學者展現台灣現今之研究成果，更能與其進行意見交流，進而達到技術成長。

二、 活動內容

會議係由 2019 年 5 月 25 日起始，25 日當日為會議報到日，26 日~29 日為正式會議報告日期，並於 29 日晚間進行閉幕儀式，相關議程各議程之主題如下:

May 25	09:30 ~ 21:00	On-site Registration (Lobby of Conference Hall)
May 26	08:10 ~ 08:30	Opening Ceremony (International Conference Center)
	09:30 ~ 12:00	Plenary Lectures (International Conference Center)
	14:00 ~ 18:00	Oral Presentations (The 2nd and 3rd Floor, Conference Hall)
	14:00 ~ 18:00	Exhibition (The 2nd Floor, Conference Hall)
May 27	08:00 ~ 18:00	Oral Presentations (The 1st, 2nd and 3rd Floor, Conference Hall)
	08:00 ~ 18:00	Exhibition (The 2nd Floor, Conference Hall)
May 28	08:00 ~ 18:00	Oral Presentations (The 2nd and 3rd Floor, Conference Hall)
	08:00 ~ 18:00	Poster Presentations (The 1st Floor, Conference Hall)
	08:00 ~ 18:00	Exhibition (The 2nd Floor, Conference Hall)
May 29	08:00 ~ 10:00	Plenary Lectures (The 3rd Floor, Conference Hall)
	10:20 ~ 18:00	Oral Presentations (The 2nd and 3rd Floor, Conference Hall)
	08:00 ~ 18:00	Poster Presentations (The 1st Floor, Conference Hall)
	08:00 ~ 18:00	Exhibition (The 2nd Floor, Conference Hall)
	18:30 ~ 21:00	Closing Banquet (International Conference Center)

List of Symposia

(A) Powder Processing and Forming Technology for Advanced Ceramics
(B) Flash and Other Field Assisted Sintering Techniques: Beyond Materials Consolidation
(C) 3D-Print of Ceramics
(D) Mechanical Behavior and Structural Applications of Ceramics and CMCs
(E) Advanced Structural Ceramics for Extreme Environments
(F) Polymer Derived Ceramics
(G) Borides and Boron Related Materials
(H) Advanced Materials for Next Generation Nuclear Energy
(I) Advanced Refractories
(J) Ecofriendly Geopolymer and Geopolymer-Developed Ceramics
(K) Advanced Ceramic Coatings for Structural and Functional Applications
(L) Tribology of Ceramics
(M) Transparent Ceramics and Luminescent Materials
(N) Dielectric, Pyroelectric, Piezoelectrics, and Ferroelectrics
(O) Perovskite
(P) Lead-Free Piezoelectric Ceramics
(Q) Magnetic and Multiferroic Ceramics
(R) Sensitive Materials and Devices
(S) Emerging Materials for Energy Harvesting and Storage
(T) Thermoelectric Materials and Devices for Energy Conversion
(U) Porous and Cellular Ceramics
(V) Advances in Bioceramics
(W) Functional Ceramics for Environmental Applications
(X) Virtual Materials Design and Ceramic Genome
(Y) The Belt & Road Ceramics Forum

三、　遭遇之問題

本研究團隊針對無機聚合技術之發展及相關成果均相較於各國發展之卓越，但世界知名度及成果展現度卻不及其他初始起步之研究團隊或國家。

四、　我方因應方法及效果

透過研討會簡報過程中，將本研究團隊之相關科研成果及實際量化成果完整且系統性展性，並與相關科研單位組建交流群組，不僅能展現本研究團隊之技術能力，未來更能與國際間相關之無機聚合技術研究團隊，有良好且零距離之溝通平台。

五、　心得及建議

無機聚合材料發展迄今已超過 30 年，由於其製程及設備簡單，整體材料本身具多項良好之工程特性，且反應均可於常溫環境下完成，較傳統卜特蘭水泥更具節能減碳之優勢。因此，近年無機聚合材料受到國際各研究單位之重視，亦有許多國家陸續開發相關技術之產品。

國際已有許多國家針對無機聚合材料已有實際商轉化產品，包含澳洲、印度、英國、美國、法國、德國、捷克…等，此外，中國大陸也正逐步重視此材料之研究發展中，對比於台灣國內，仍趨於保守心態，因此仍未能有效且大規模之研究，因此相比於各國之研究成果，雖然多元化應用之開發勝於其他國家，但是就研究團隊之規模及研究精進度而言，仍屬弱勢。

因此，藉由此次研討會之參與，並且和世界各國之無機聚合技術領域專家進行意見交流後，著實能提升自我研究之視野及多項突破性之思考，也能透過多方交流之成果，搭建起未來跨國研究之可行性，期望未來能確實達到跨國且跨領域之共同交流合作，藉以將無機聚合技術不僅於台灣國內成功推向商轉化，更能於世界上站穩一席之地。

參、謹檢附參加本次活動（會議）之相關資料如附件，報請

備查。

職

2019 年　06　月　07　日

附件一

1. 參與人員發表之文章摘要及簡報資料

- 鄭大偉教授(計畫主持人)

發表題目：Recycling Basic Oxygen Furnace Slags by using Geopolymer Technology

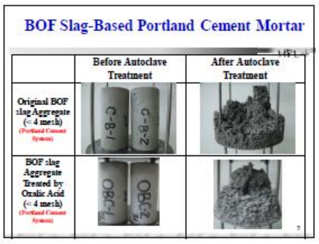
文章摘要：

Basic Oxygen Furnace (BOF) Slag is a by-product of iron making. There are 1.6 million tons produced in Taiwan every year. It has great engineering properties. However, the main problem for BOF slag is expansion. In this study, geopolymer technology was developed for stabilization/reutilization BOF slag. Geopolymer processes contain large amount of free silicon. These free silicon can react with free-lime in BOF slag, and thus to form a stable calcium silicate compound, therefore inhibit the expansion of the BOF slag. This will not only completely solve the BOF slag production problem but also can turn them into valuable products. It is of great significance to reach the goals of waste recycling, social, economic, academic development and in accordance with the principles of Circular Economy.

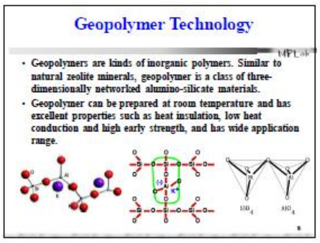
簡報資料：

1

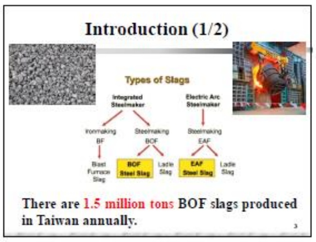
2



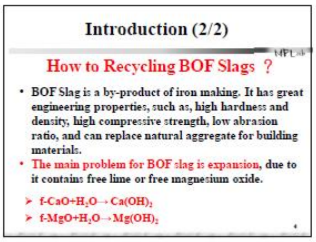
7



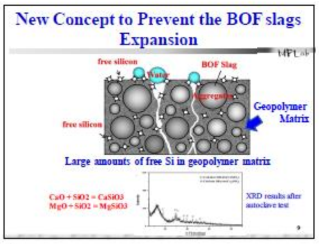
8



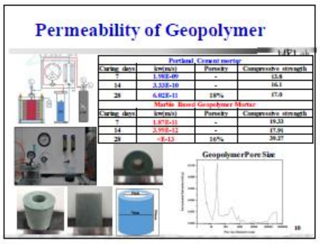
3



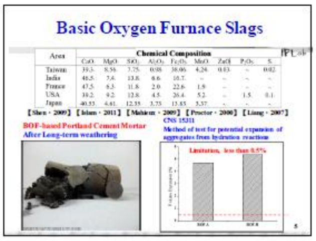
4



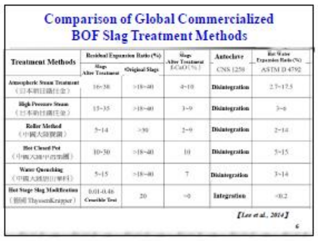
9



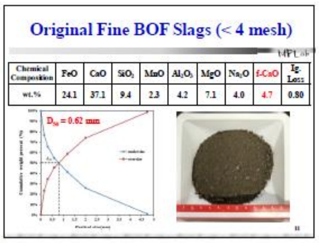
10



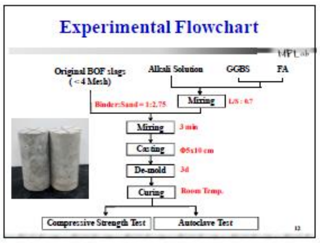
5



6

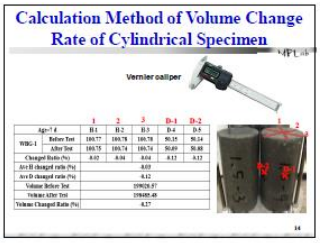


11

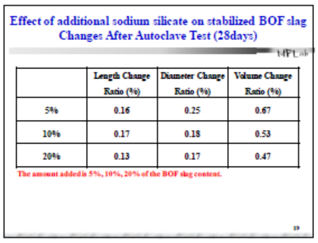


12

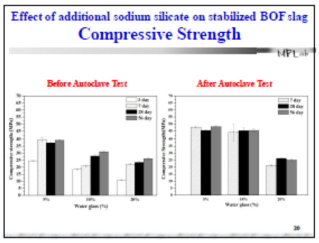
13



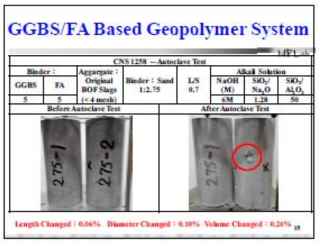
14



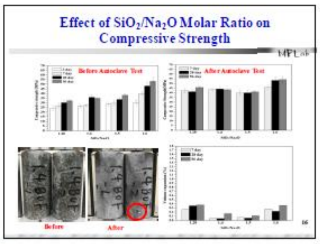
19



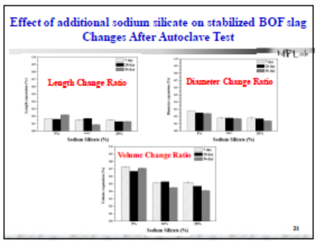
20



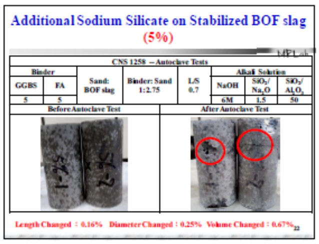
15



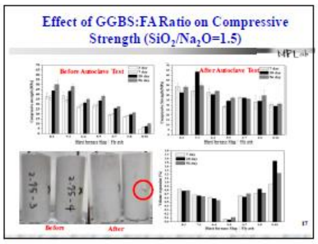
16



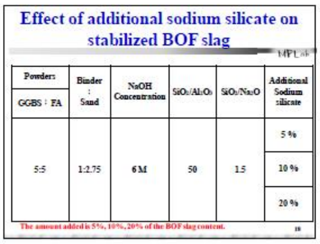
21



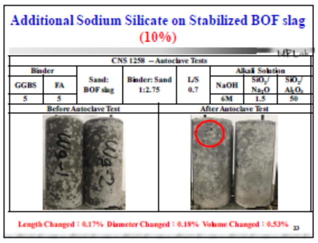
22



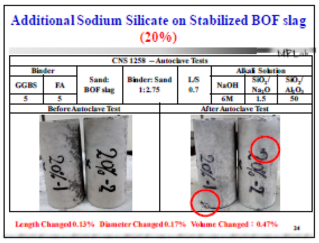
17



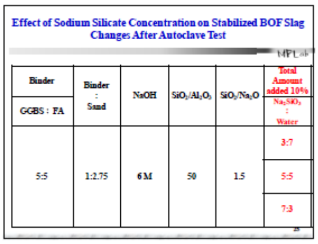
18



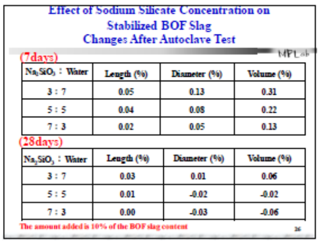
23



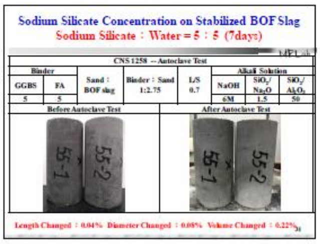
24



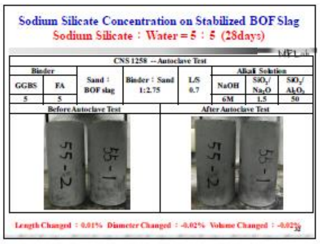
25



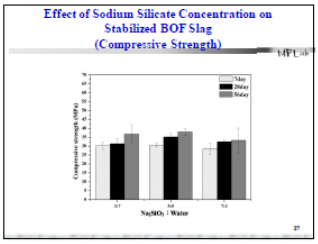
26



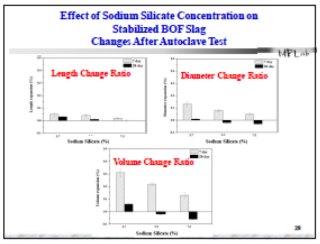
31



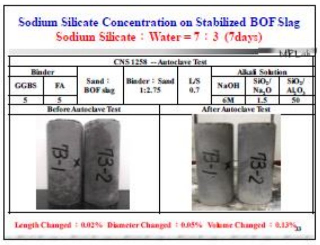
32



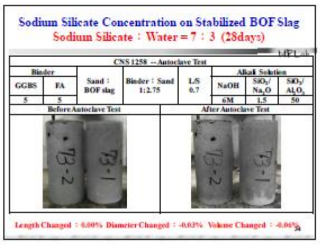
27



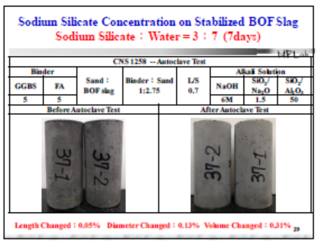
28



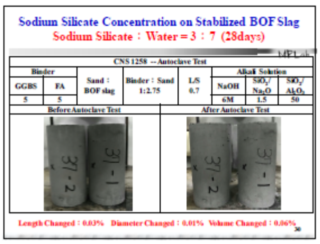
33



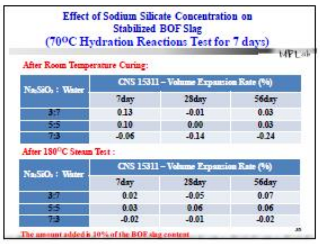
34



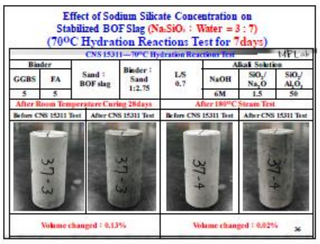
29



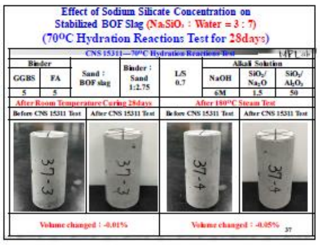
30



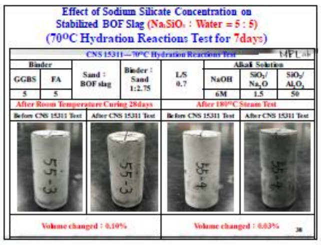
35



36

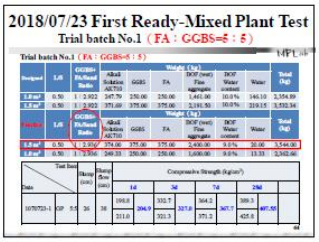


37

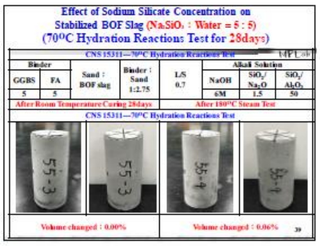


38

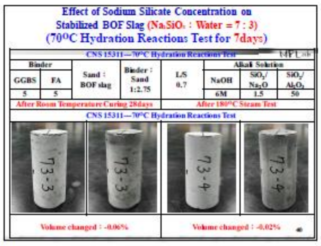
43



44

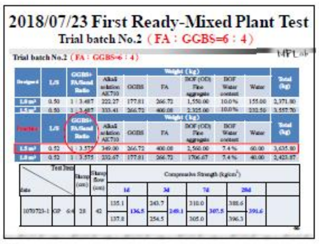


39

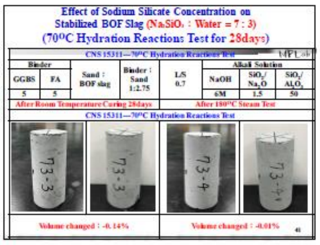


40

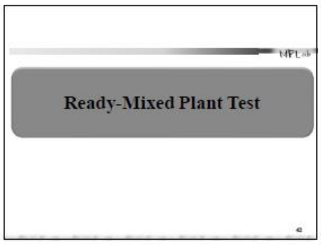
45



46

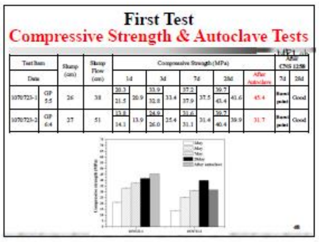


41



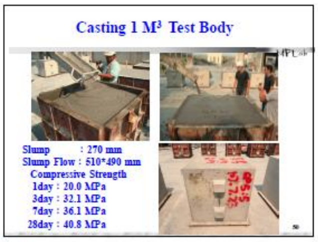
42

47

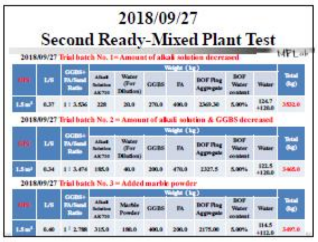


48


49



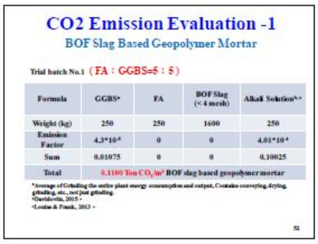
50



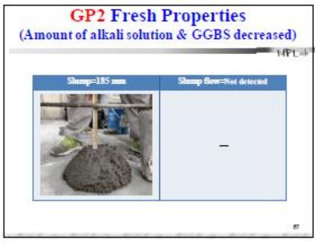
55

56

51

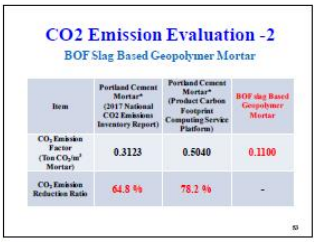


52



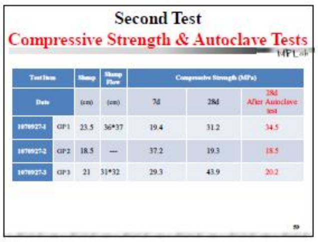
57

58



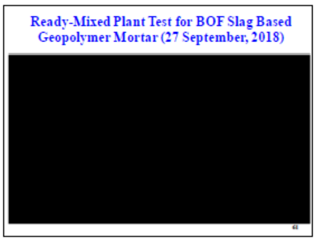
53

54

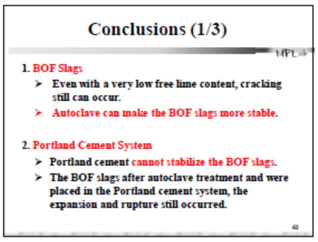


59

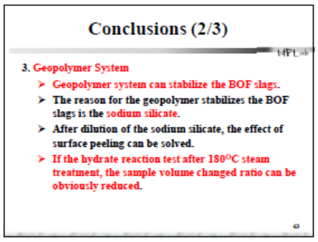
60



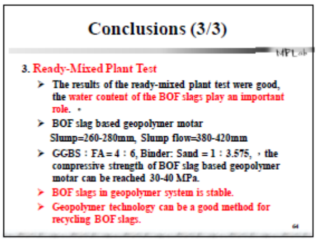
61



62



63



64

65

● 李韋皞博士(協同主持人)

發表題目：The effect of microstructure development on mechanical properties of slag-based geopolymer

文章摘要：

Geopolymer materials have been developed over 30 years. Until recently, geopolymer is heeded by global research institutes and many countries, due to geopolymers containing great properties, simple production equipment and fabrication process at room temperature. It has good development potential for engineering application.

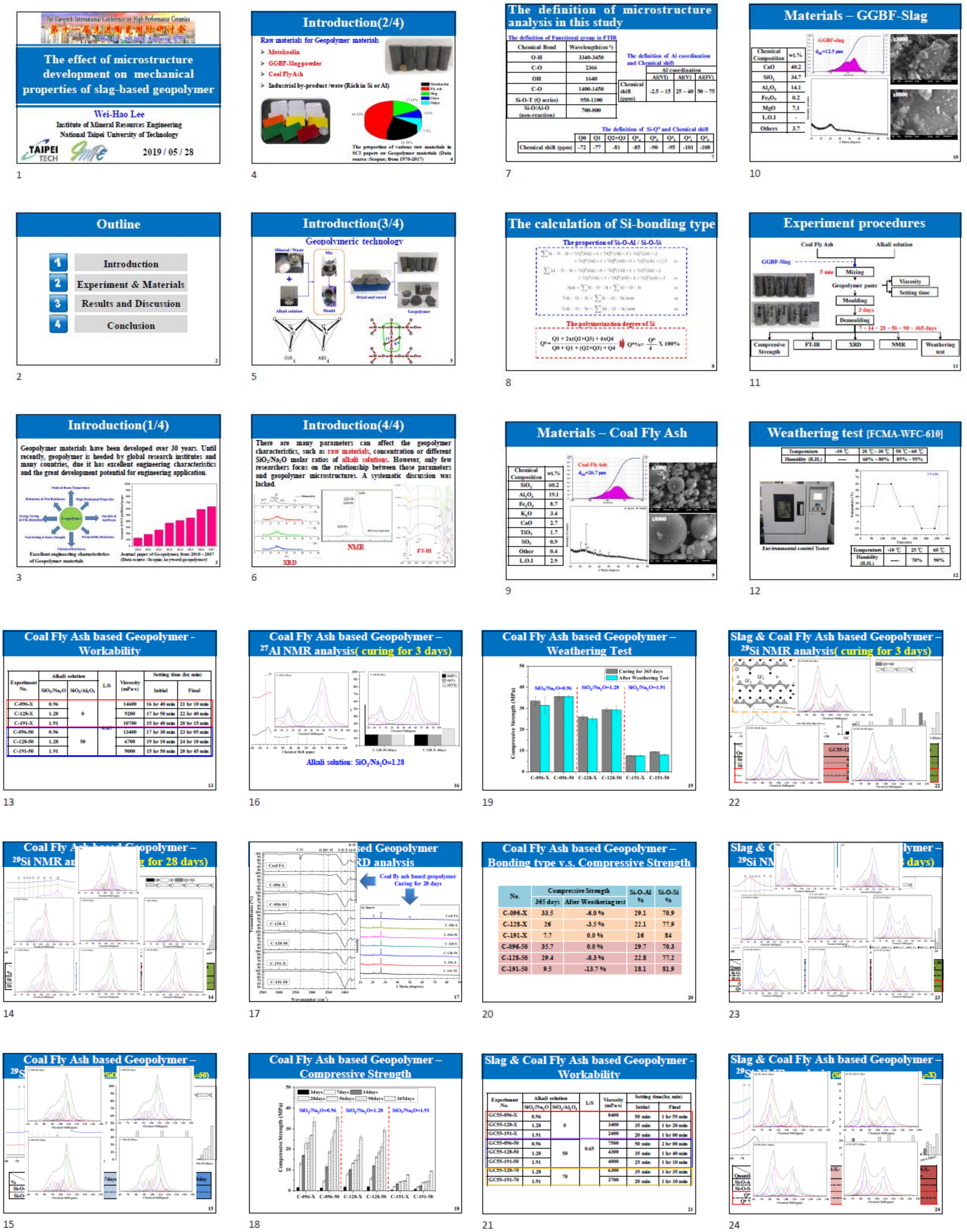
There are many parameters can affect the geopolymer characteristics, such as sources of raw materials, concentration or different SiO_2/Na_2O molar ratios of alkali solutions. However, little researchers focus on the relationship between those parameters and geopolymer microstructures. A systematic discussion was lacked.

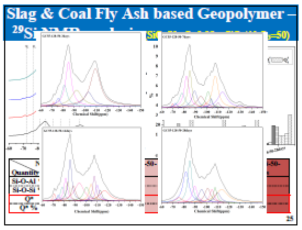
In this study, metakaolin, ground-granulated blast-furnace slag, coal fly ash were used as raw materials. After raw materials mixing with different formulations of alkaline solution, geopolymer materials were formed. NMR, XRD and FT-IR were used to analyze the interior Si, Al structures after curing various days. In order to understand the relationship between each other, all of the Si, Al structures analyzed results were compared with its mechanical properties.

According to the results, the ground-granulated blast-furnace slag involved in geopolymer reaction, it becomes the major influence factor on slurry setting time, compressive strength and the amount of Si-O-Al bonding structures. According to the ^{29}Si NMR and XRD analysis results, with GGBF slag involving in the reaction, the geopolymer Si Q^4_4 structure increased and the pozzolanic reaction also occurred. Both of above reaction can improve the compressive strength of the geopolymer. On the other hand, when GGBF slag was added, the pozzolanic reaction caused Q2 and Q3 structures increased, consequently reduced the degree of polymerization of Si. However, both Q2 and Q3 structures can provide the material strength development.

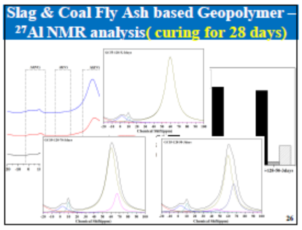
In this study, the microstructural development of three kinds of commonly used raw materials in geopolymer was investigated Base on the experimental results, it is expected to be able to through this study as the basis for later research.

簡報資料：

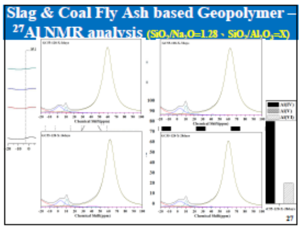




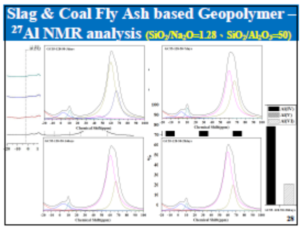
25



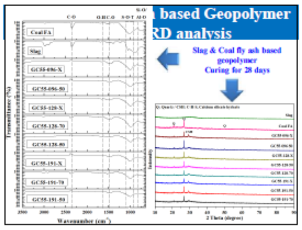
26



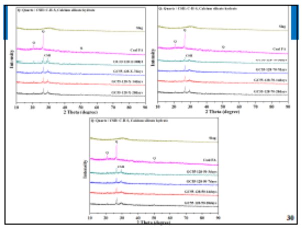
27



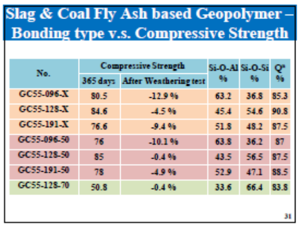
28



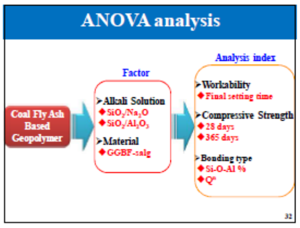
29



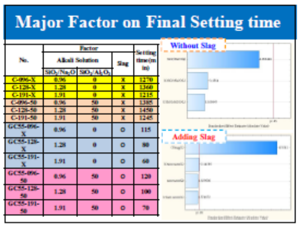
30



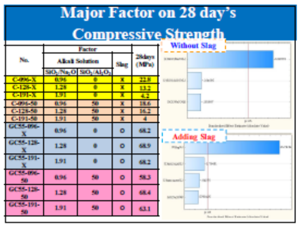
31



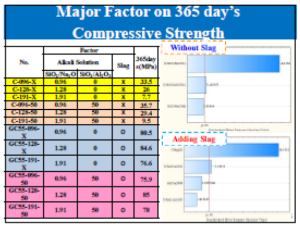
32



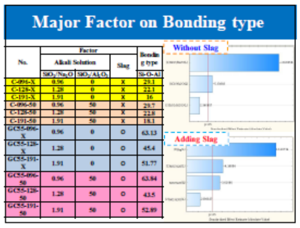
33



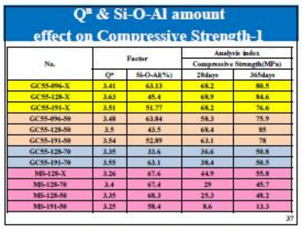
34



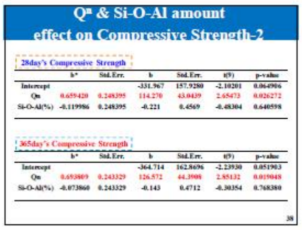
35



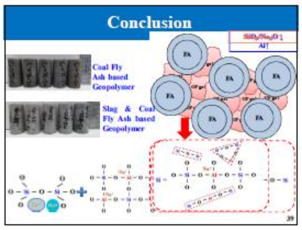
36



37

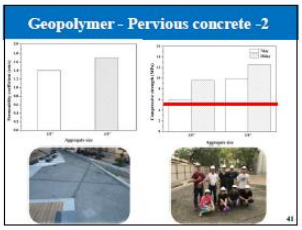


38



39

40



41

42

43

44

2. Ecofriendly Geopolymer and Geopolymer-Developed Ceramics 議程之相關發表文章

Programme Schedule • Afternoon, May 28

Symposium J: Ecofriendly Geopolymer and Geopolymer-Developed Ceramics
(Conference Hall, The Third Floor, Room 2)

14:00 ~ 16:00
Chair: D.C. Jia (*Harbin Institute of Technology, China*)

14:00		**Welcome address** D.C. Jia (*Harbin Institute of Technology, China*)
14:10	**J001 Keynote**	**Recent development of geopolymer and geopolymer based composites** P.G. He (*Harbin Institute of Technology, China*)
14:40	**J004 Keynote**	**Ultra-high performance geopolymer concrete (UHPGC)** Z.H. Zhang (*Hunan University, China*)
15:10	**J020 Invited**	**Basic research on immobilization and disposal of nuclear waste with geopolymer** X. Ma (*Southwest University of Science and Technology, China*)
15:35	**J017 Invited**	**One-pot preparation of NaA zeolite microspheres for highly selective and continuous removal of Sr(II) from aqueous solution** K.T. Wang *(Guangxi University, China*)

16:10 ~ 18:00
Chair: Z.H. Zhang (*Hunan University, China*)

16:10	**J002 Keynote**	**Recycling basic oxygen furnace slags by using geopolymer technology** T.W. Cheng (*National Taipei University of Technology, Taiwan*)
16:40	**J003 Keynote**	**Progress in phosphate and geopolymer cements with primary battery and steel slag wastes** H.A. Colorado (*Universidad de Antioquia, Colombia*)
17:10	**J016 Invited**	**The effect of microstructure development on mechanical properties of slag-based geopolymer** W.H. Lee (*National Taipei University of Technology, Taiwan*)
17:35	**J011 Invited**	**Performance evaluation of geopolymer modified by different solid wastes** H. Wang (*Rutgers University, USA*)

Programme Schedule • Morning, May 29

Symposium J: Ecofriendly Geopolymer and Geopolymer-Developed Ceramics
(Conference Hall, The Third Floor, Room 2)

10:00 ~ 11:40
Chair: Z.Y. Lai (*Southwest University of Science and Technology, China*)

10:00	**J108**	**One-step synthesis of all-inorganic $CsPbX_3$ (X= Cl, Br, and I) aluminosilicate inorganic polymer composite to improve quantum dot stability** J.Y. Cui (*Harbin Institute of Technology, China*)
10:20	**J103**	**Early mechanical properties and microstructural evolution of slag/metakaolin-based geopolymers exposed to karst water** J.C. Xiang (*Guangxi University, China*)
10:40	**J109**	**Hydrothermal synthesis of zeolite and its adsorption and immobilization of cesium** M.L. Wang (*Harbin Institute of Technology, China*)
11:00	**J107**	**The effect of carboxyl starch sodium (CMS-Na) on the rheology behavior and geopolymerization kinetics of alkali-activated slag based geopolymer** Z.X. Lin (*Guangxi University, China*)
11:20	**J111**	**Using ion-exchanged geopolymer as versatile precursor for the design and preparation of celsian ceramics** S. Fu (*Harbin Institute of Technology, China*)

Programme Schedule • Afternoon, May 29

Symposium J: Ecofriendly Geopolymer and Geopolymer-Developed Ceramics
(Conference Hall, The Third Floor, Room 2)

14:00 ~ 15:40
Chair: T.W. Cheng (*National Taipei University of Technology, Taiwan*)

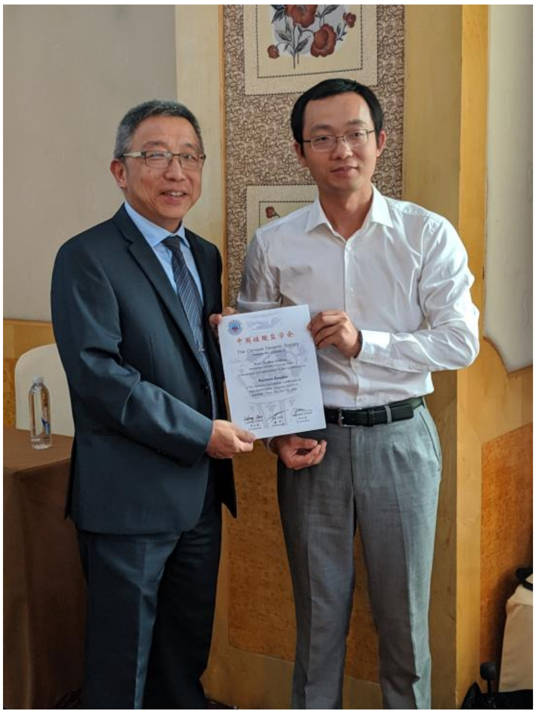
14:00	**J012 Invited**	**Design and preparation of engineered geopolymeric composites (EGC)** X.L. Guo (*Tongji University, China*)
14:25	**J013 Invited**	**Enhanced separation efficiency and durability of a geopolymer composite membrane coupled with laccase for dye removal in water** Y.Y. Ge (*Guangxi University, China*)
14:50	**J014 Invited**	**Development of building insulation materials from geopolymer** M.R. Wang (*Harbin Institute of Technology, Weihai, China*)
15:15	**J019 Invited**	**Geopolymers containing cesium and the structure transformation under hydrothermal or thermal treatment** Z.Y. Lai (*Southwest University of Science and Technology, China*)

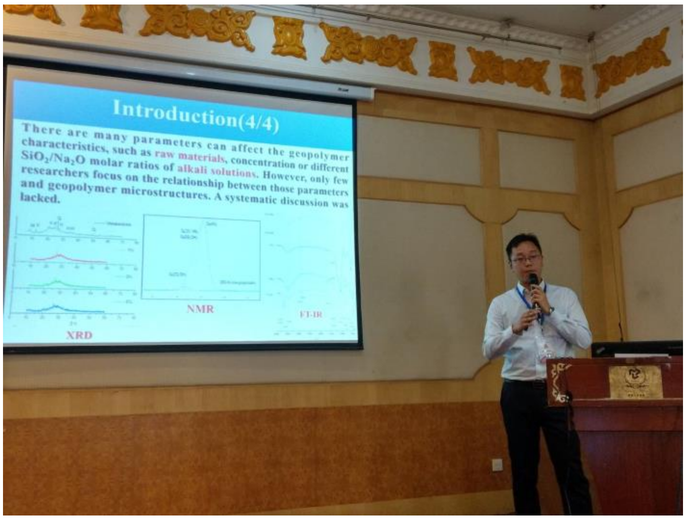
15:50 ~ 17:50
Chair: H.A. Colorado (*Universidad de Antioquia, Colombia*)

15:50	**J015 Invited**	**Processing, microstructure, properties, and applications of highly porous geopolymers** C.Y. Bai (*Harbin Engineering University, China*)
16:15	**J018 Invited**	**Metakaolin-based geopolymer: formation process and the structures** J. Li (*Southwest University of Science and Technology, China*)
16:40	**J021 Invited**	**Geopolymerization and in-situ preparation of graphene/leucite through reduced graphene oxide/geopolymer composites** S. Yan (*Northeastern University, China*)
17:05	**J022 Invited**	**Effects of Li^+ substitution on the microstructure and properties of composites derived from $C_f/Cs_{(1-x)}Li_xGPs$** J.K. Yuan (*Harbin Institute of Technology, China*)
17:30	**J110**	**Bio-electrochemical studies for harvesting carbon dioxide to organic compounds** R. Farooq (*COMSATS University Islamabad, Pakistan*)

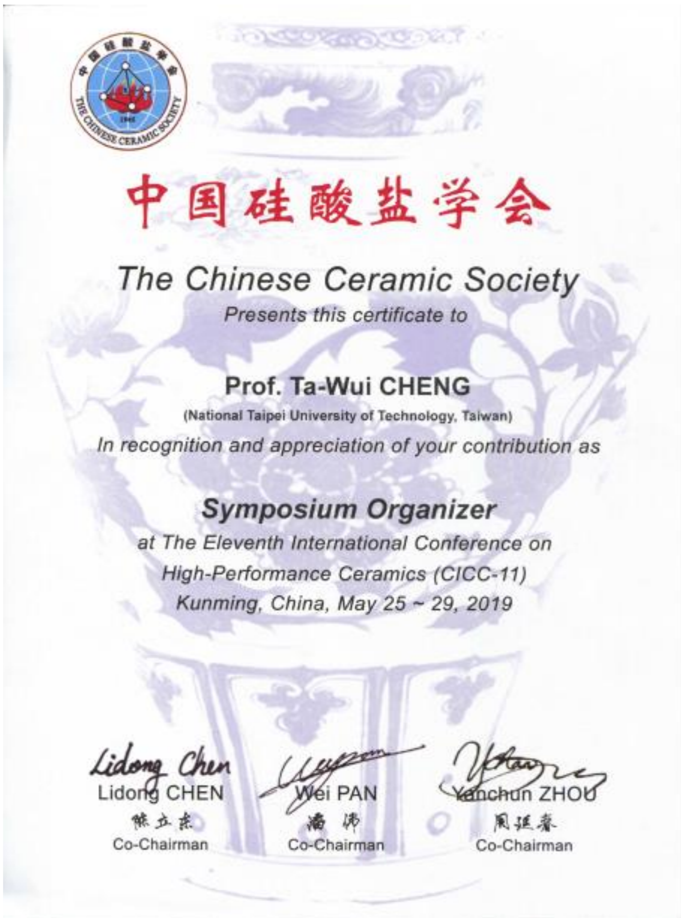
---

3. 相關照片




Introduction(4/4)
There are many parameters can affect the geopolymer characteristics, such as raw materials, concentration or different SiO_2/Na_2O molar ratios of alkali solutions. However, only few researchers focus on the relationship between those parameters and geopolymer microstructures. A systematic discussion was lacked.
XRD
NMR
FT-IR

4. 與會證書



中国硅酸盐学会

The Chinese Ceramic Society

Presents this certificate to

Prof. Ta-Wui CHENG

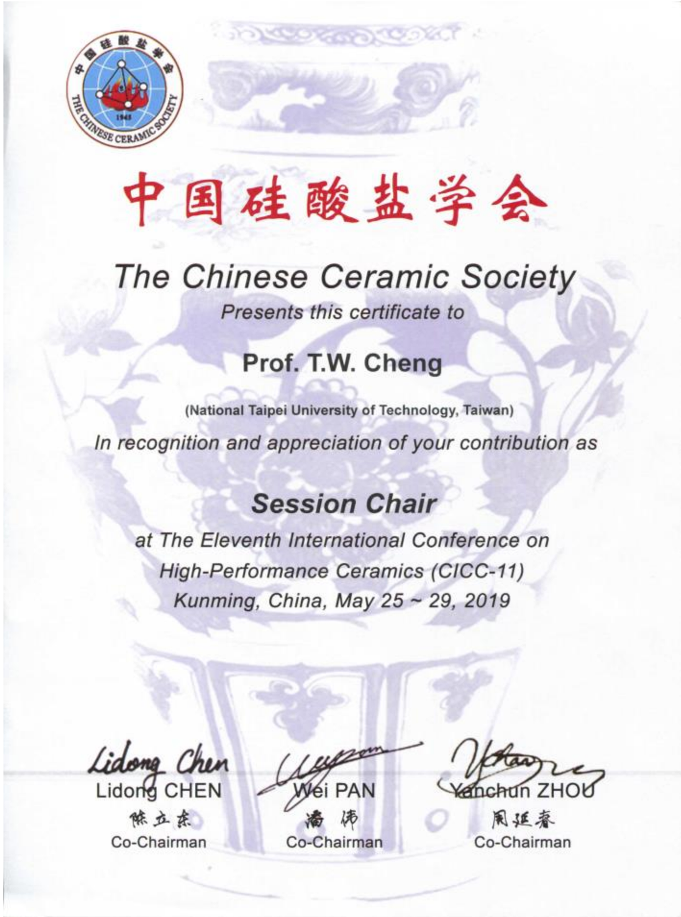
(National Taipei University of Technology, Taiwan)

In recognition and appreciation of your contribution as

Symposium Organizer

at The Eleventh International Conference on High-Performance Ceramics (CICC-11) Kunming, China, May 25 ~ 29, 2019

Lidong CHEN	Wei PAN	Yanchun ZHOU
陈立东	潘伟	周延春
Co-Chairman	Co-Chairman	Co-Chairman



中国硅酸盐学会

The Chinese Ceramic Society

Presents this certificate to

Prof. T.W. Cheng

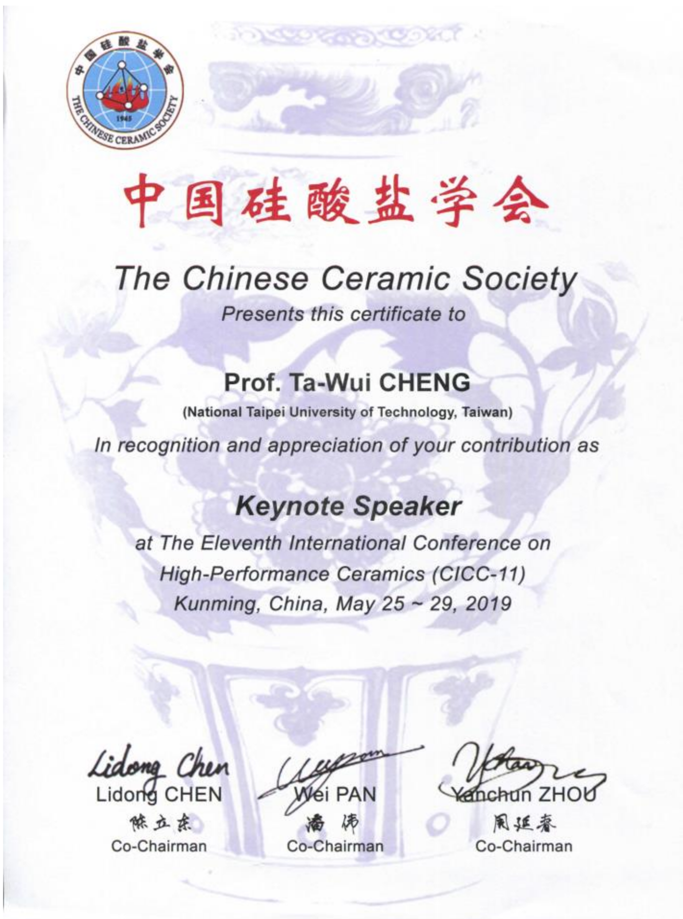
(National Taipei University of Technology, Taiwan)

In recognition and appreciation of your contribution as

Session Chair

at The Eleventh International Conference on High-Performance Ceramics (CICC-11) Kunming, China, May 25 ~ 29, 2019

Lidong CHEN	Wei PAN	Yanchun ZHOU
陈立东	潘伟	周延春
Co-Chairman	Co-Chairman	Co-Chairman



中国硅酸盐学会

The Chinese Ceramic Society

Presents this certificate to

Prof. Ta-Wui CHENG

(National Taipei University of Technology, Taiwan)

In recognition and appreciation of your contribution as

Keynote Speaker

at The Eleventh International Conference on High-Performance Ceramics (CICC-11) Kunming, China, May 25 ~ 29, 2019

Lidong CHEN	Wei PAN	Yanchun ZHOU
陈立东	潘伟	周延春
Co-Chairman	Co-Chairman	Co-Chairman

中国硅酸盐学会

The Chinese Ceramic Society

Presents this certificate to

Dr. Wei-Hao LEE

(National Taipei University of Technology, Taiwan)

In recognition and appreciation of your contribution as

Invited Speaker

at The Eleventh International Conference on High-Performance Ceramics (CICC-11) Kunming, China, May 25 ~ 29, 2019

Lidong CHEN	Wei PAN	Yanchun ZHOU
陈立东	潘伟	周延春
Co-Chairman	Co-Chairman	Co-Chairman