

THE 6th INTERNATIONAL SYMPOSIUM ON CEMENT & CONCRETE

CANMET/ACI INTERNATIONAL SYMPOSIUM ON CONCRETE TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT

SEPTEMBER 19-22, 2006
XI'AN, CHINA

VOLUME 2



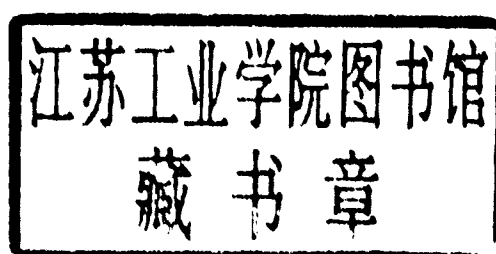
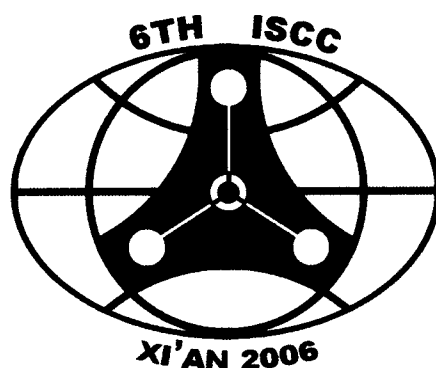
FOREIGN LANGUAGES PRESS

Cement & Concrete, Contributing to Global Sustainability

**PROCEEDINGS OF
THE 6th INTERNATIONAL SYMPOSIUM
ON CEMENT & CONCRETE**

**CANMET /ACI INTERNATIONAL SYMPOSIUM ON
CONCRETE TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT**

**SEPTEMBER 19~22, 2006
XI'AN, CHINA**



VOLUME 2

FOREIGN LANGUAGES PRESS

图书在版编目 (CIP) 数据

第六届水泥与混凝土国际会议及 CANMET/ACI 混凝土技术可持续发展国际会议论文集 /

隋同波 沈荣熹 张文生编.

北京: 外文出版社, 2006

ISBN 7-119-02249-0

I. 第… II. 隋… III. ①水泥工业—国际学术会议—文集—英文②混凝土—国际学术会议—文集—英文 IV. ①TQ172-53②TU528-53

中国版本图书馆 CIP 数据核字 (2006) 第 048561 号

外文出版社网址:

<http://www.flp.com.cn>

外文出版社电子信箱:

info@flp.com.cn

sales@flp.com.cn

Proceedings of the 6th International Symposium on Cement and Concrete &
CANMET /ACI International Symposium on Concrete Technology for Sustainable Development

**第六届水泥与混凝土国际会议及
CANMET/ACI 混凝土技术可持续发展国际会议论文集**

主 编 隋同波

副 主 编 沈荣熹 张文生

责任编辑 刘承忠

封面设计 姚 波

出版发行 外文出版社

社 址 北京市百万庄大街 24 号 邮政编码 100037

印 刷 北京市京津彩印有限公司

开 本 大 16 开 (880mm×1230mm)

字 数 1500 千

印 张 106.75

版 次 2006 年第 1 版第 1 次印刷

装 别 精

书 号 ISBN 7-119-02249-0

定 价 950 元 (上、下)

版权所有 侵权必究

Conference Review

International Symposium on Cement and Concrete (ISCC)



The 5th ISCC was held in October, 1998 in Shanghai, China. It was organized by the Chinese Ceramic Society (CCS) and sponsored by China Building Materials Academy (CBMA) and Tongji University. The theme of the symposium was to promote the sustainable development of cement and concrete industries in the 21st century. There were 254 delegates including 80 international participants from 20 countries to attend the conference. 219 papers, including 70 papers from abroad, were collected in the proceedings of the symposium.



The 4th Beijing International Symposium on Cement & Concrete (BISCC) was held in October, 1998 in Beijing. It was organized by CCS and sponsored by CBMA. There were 294 delegates including 72 international participants from 21 countries to attend the conference. 195 papers, including 76 papers from abroad, were collected in the proceedings of the symposium.



The 3rd BISCC was held in October, 1993 in Beijing. It was organized by CCS and sponsored by CBMA. There were 360 delegates including 130 international participants from 21 countries to attend the conference. 267 papers, including 97 papers from abroad, were collected in the proceedings of the symposium.



The 2nd BISCC was held in September, 1989 in Beijing. It was organized by CCS and sponsored by CBMA. There were 212 delegates including 34 international participants from 13 countries to attend the conference. 160 papers, including 33 papers from abroad, were collected in the proceedings of the symposium.



The 1st BISCC was held in May, 1985 in Beijing. It was organized by CCS and sponsored by CBMA. There were 215 delegates including 74 international participants from 13 countries to attend the conference. 141 papers, including 64 papers from abroad, were collected in the proceedings of the symposium. After 1985, BISCC was being held every four years.

CANMET /ACI International Symposium on Concrete Technology for Sustainable Development

This event started in 1978 with objectives to transfer concrete technology worldwide. Today more than 40 international conferences and seminars have been held worldwide in USA, Canada, India, France, Japan, Spain, Greece, Romania, Singapore, Australia, Germany, Lebanon, Norway and now in China.

Themes covered: Fly ash, silica fume, slag and natural pozzolanas, Durability of concrete, Superplasticizers and other chemical admixtures, Concrete in marine environment, NDT Sulphur in concrete, Sustainability in concrete technology and Advancement in concrete technology.

CANMET and ACI are principal sponsors and referred proceedings are published by the American Concrete Institute.

The Permanent Committee is chaired by Prof. Mohan Malhotra and there are 6 other members. The Committee is located in Ottawa-Montreal, Canada.

PROCEEDINGS OF THE 6th INTERNATIONAL SYMPOSIUM ON CEMENT & CONCRETE

CANMET/ACI INTERNATIONAL SYMPOSIUM ON CONCRETE TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT

SEPTEMBER 19~22, 2006

XI'AN, CHINA

ORGANIZORS The Chinese Ceramic Society
Committee for the Organization of CANMET/ACI International Conferences (American
Concrete Institute Council)

SPONSOR China Building Materials Academy

CO-SPONSORS National Natural Science Foundation of China
China Cement Association
Xi'an University of Architecture & Technology
Xi'an Research and Design Institute of Wall & Roof Materials
China ISO Standard Sand Co., Ltd.
Beijing Ceramic Society
Shanxi Ceramic Society
UNIDO International Center for Materials Technology Promotion
Productivity Center of Building Materials Industry, China
Dow Reichhold Specialty Latex LLC
W. R. Grace & Co., -Conn.
Lafarge Cement Co., Ltd.
China United Cement Co., Ltd
Tangshan Jidong Cement Co., Ltd.
Jilin Tonghua Special Cement Co., Ltd.

EDITED BY	Sui Tongbo (Editor in Chief)	
	Shen Rongxi (Sub-Editor)	Zhang Wensheng (Sub-Editor)
	Deng Min	Hu Jiashan
	Li Juan	Li Shiqun
	Li Yue	Qin Weizu
	Wang Lan	Wang Ling
	Wang Ziming	Xi Yaozhong
	Yan Peiyu	Zhang Shaozhou

Symposium Chairmen

Zhang Renwei	President of China Building Materials Industry Association, Board Chairman, of Chinese Ceramic Society, China
V.Mohan Malhotra	Special Advisor, ICON/CANMET, Emeritus Scientist, MMS/MTB/MTL Natural Resources, Canada

International Advisory Committee

V.M.Malhotra	Special Advisor, ICON/CANMET, Emeritus Scientist, MMS/MTB/MTL Natural Resources, Canada
P.K.Mehta	Professor Emeritus, University of California, USA
S.Nagataki	Professor, Aichi Institute of Technology, Japan
Y.Ohama	Professor, Department of Architecture College of Engineering Nihon University, Koriyama, Fukushima-ken, Japan
M.Daimon	Professor, Department of Inorganic Materials, Tokyo Institute of Technology, Japan
S.P.Shah	Walter P. Murphy Professor of Civil Engineering, Director, Center for Advanced Cement-Based Materials Northwestern University, USA
Jim Beaudoin	Concrete Materials and Structural Technologies Institute for Research in Construction, National Research Council Canada, Canada
Karen Scrivener	Professor, Laboratory of Construction Materials, Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland
Leslie Struble	Professor, Director of the Center for Cement Composite Materials, Civil and Environmental Engineering, University of Illinois Urbana-Champaign, Illinois, USA
G.R.H. Grieve	Managing Director of Cement & Concrete Institute, South Africa
Tang Mingshu	Professor, Member of China Academy of Engineering, Director of Silicate Research Laboratory, Nanjing University of Technology, China
Xu Delong	Professor, Member of China Academy of Engineering, President of Xi'an University of Architecture & Technology, China
Sun Wei	Professor, Member of China Academy of Engineering, Southeast University, China

Academic Committee

Honorary Chairman

Ouyang Shixi Professor, China Building Materials Academy, China

Chairlady

Yao Yan Professor, President, China Building Materials Academy, China

Vice Chairmen

Li Zongjin Professor, Hong Kong University of Science & Technology, China

E.Sakai Professor, Tokyo Institute of Technology, Japan

Members

Chen Yimin Professor, China Building Materials Academy, China

Cheng Xin Professor, President, Ji'nan University, China

Cui Qi Professor, Director, Research Institute of Cement and New Building Materials, China Building Materials Academy, China

David J Dai Professor, Dow Reichhold Specialty Latex LLC, USA

Miao Changwen Professor, President, Jiangsu Research Institute of Building Science, China

Shao Yixin Professor, Department of Civil Engineering, McGill University, Canada

Shen Rongxi Professor, Consultant, China Building Materials Academy, China

Shi Caijun Professor, W. R. Grace & Co. -Conn., USA

Sui Tongbo Professor, Vice-President, China Building Materials Academy, China

Tang Boling Professor, Consultant, Hefei Cement Research & Design Institute, China

Tang Ming Professor, Director of Shenyang Architectural and Civil Engineering Institute, Research Institute of Building Materials, China

Wang Lan Professor, China Building Materials Academy, China

Wang Peiming Professor, President, Dean of School of Materials Science and Engineering, Tongji University, China

Xi Yunping Professor, University of Colorado, USA

Yan Peiyu Professor, Tsinghua University, China

Yu Qijun Professor, Vice-President, College of Materials Science and Engineering, South China University of Technology, China

Zhang Minhong Professor, Department of Civil Engineering National University of Singapore, Singapore

Zhu Rongyue President, Suzhou Concrete and Cement Products Research Institute, China

Zhu Weizhong President, Vice Chief Engineering, Heilongjiang Cold Region Construction Science Research Institute, China

Organizing Committee

Honorary Chairman

Song Zhiping Chairman of the Board, China National Building Materials Group Corporation;
Vice-President, Chinese Ceramic Society

Chairman

Jin Zhanping Secretary-General, Chinese Ceramic Society

Vice Chairmen

Gao Ruiping Vice-Director, Division of Engineering and Materials Science, National Natural Science
Foundation of China, China

Tan Fu Vice Secretary-General, Chinese Ceramic Society, China

Sui Tongbo Vice-President, China Building Materials Academy

Members

Cai Keyu Director, International Department, Chinese Ceramic Society, China

Cao Yongkang Board Chairman, Concrete and Cement Products Branch of Chinese Ceramic Society,
China

Cui Xingtai Chairman of the Board, China United Cement Co., Ltd, China

Jiao Yongdao Board Chairman, Environment Protection Branch of Chinese Ceramic Society, China

Kong Xiangzhong Secretary-General, China Cement Association, China

Liu Guanghua Professor, Vice-Director, Research Institute of Cement and New Building Materials,
China Building Materials Academy, China

Li Guochang Chairman of the Board, Jilin Tonghua Special Cement Co., Ltd, China

Liu Xide General Manager, China ISO Standard Sand Co., Ltd, China

Song Ying Secretary-General, Concrete and Cement Products Branch of Chinese Ceramic Society,
China

Wang Yimin Board Chairman, Automation Branch of Chinese Ceramic Society, China

Wang Youyun Honorary Board Chairman, Cement Branch of Chinese Ceramic Society, China

Xiao Hui President, Xi'an Research and Design Institute of Wall & Roof Materials, China

Xu Yongmo Director, China Cement Products Association, China

Zhang Zengguang General Manager, Tangshan Jidong Cement Co., Ltd., China

Secretary-General

Sui Tongbo Professor, Vice-President, China Building Materials Academy, China

Vice Secretary-General

Zhang Wensheng Professor, Research Institute of Cement and New Building Materials, China Building
Materials Academy, China

Xin Zhijun Senior Engineer, Research Institute of Cement and New Building Materials, China
Building Materials Academy, China

PREFACE

Sponsored by the Chinese Ceramic Society and Committee for the Organization of CANMET/ACI International Conferences (American Concrete Institute Council), The 6th International Symposium on Cement and Concrete (6th ISCC), formally known as the Beijing International Symposium on Cement and Concrete, and CANMET/ACI Conferences, started in 1978 with objectives to transfer concrete technology worldwide, are held together in Ana Grand Castle Hotel in Xi'an, P. R. China from Sept. 19 to 22, 2006.

The objectives of the symposium are to review the latest advances in the fields of cement and concrete since 5th International Symposium held in 2002 in Shanghai, and to provide a forum for discussion on the how to promote the Contribution of the Cement & Concrete to Global Sustainability.

The proceedings, which comprise 251 papers to be committed by the 6th ISCC Academic Committee, cover four themes, namely the new technology and equipment for cement manufacturing, Portland cement and special cement, concrete, dry-mixed mortar and cement product and mineral admixture and chemical admixture.

The work of the event was an immense undertaking and all of involved are gratefully acknowledged, in particular, the members of the Organizing Committee for managing the event from start to finish, the members of the Academic Committee for advising the selection and reviewing of the papers, the members of the Editing Committee for editing the proceedings, the organizations for their invaluable contributions to the symposium and the proceedings.

Professor Yao Yan

Chairlady of the Academic Committee of the 6th ISCC
& CANMET/ACI International Symposium on
Concrete Technology for Sustainable Development

Xi'an, P. R. China
Sept 19, 2006



中国联合水泥有限责任公司 China United Cement Co., Ltd.

China United Cement Co., Ltd. (CUCC), established in June 1999, is one of the four big manufacturing bases of China National Building Materials Group Corporation (CNBM), one of the four sub-enterprises of China National Building Materials Stock Company, and one of the nine cement groups supported by Chinese government. In 2005, CUCC is among the top three cement manufacturers in China with annual capacity of 16 million tons.

The goal of CUCC is to be the pioneer and leader in cement industry and to build a united cement fleet in China. Annual capacity of CUCC is planned to reach 30 million tons in 2007 and 80 million tons in 2010. In 2010, CUCC will step into the top ten cement manufacturers in the world.

Add.: No.2 Zizhuyuan South Road, Haidian District, Beijing, 100044, China

Tel: +86-010-88416688 Fax: 010-88512930

E-mail: cucc@cnbm.com.cn Web Site: <http://www.cucc.cn>

吉林通化特种水泥（集团）有限责任公司 Jilin Tonghua Special Cement (Group) Co., Ltd.

Jilin Tonghua Special Cement (Group) Co., Ltd. (JTSC), one of top enterprises in Jilin Province, is the special cement base specially supported by provincial building materials industry. It is the leading company in building materials industry and is one of the three pillar industries in Tonghua.

JTSC has two automatic controlled cogeneration rotary kilns of $\phi 3.6 \times 70\text{m}$ and one new dry process production line with rotary kiln of $\phi 3.2 \times 50\text{m}$. In 2001, JTSC merged Mei Hekou Cement Plant and Liuhe Cement Plant and transformed them into grinding plants with the annual capacity of 200,000 tons. As the largest cement producer in the area, JTSC has the annual capacity of 1.6 million tons of cement. So far, the company has grown into an incorporate body from cement and cement products manufacturing to building materials machinery. Currently, there are 963 personnel in JTSC, among which 162 are professionals. The company owns reasonable structure of human resources and strong technical power. A specialized technical R&D centre was established to develop new products and to introduce new technology. The renovation has been proved to be a success in the past years.

The low alkali cement, road cement, moderate & low heat cement, and ordinary cement of "Shanquan" brand produced by JTSC are widely used in many national key projects, including bridges, airports, dams and high-rise buildings. These products win the honor of "Certificate for Product Exemption from Quality Surveillance Inspection", "Jilin Famous Brand", "State Recommended Building Materials", "Green Building Materials" etc. JTSC passed the Quality Management System Certification, Quality Assurance System Certification as well as environment authentication. JTSC also got the Patent Certification issued by the Chinese government.

Add.: Shuidong, Tonghua, Jilin, 134004, China

Tel: +86-0435-3741678 Fax: +86-0435-3741018

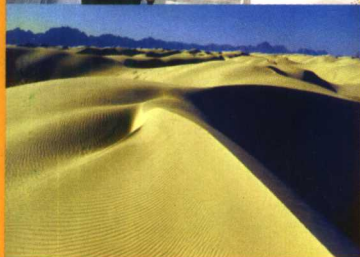
E-mail: lqc@unitednet.com.cn Web Site: [Http://WWW.thsqcement.com.cn](http://WWW.thsqcement.com.cn)



中国 ISO 标准砂

CHINA ISO STANDARD SAND

STANDARD SAND FOR STRENGTH DETERMINATION OF CEMENT
TO ISO679 AND EN 196-1



厦门艾思欧标准砂有限公司成立于1999年，是国家授权中国唯一生产经营ISO标准砂的企业。中国ISO标准砂是按照国际标准ISO679生产的水泥强度检验基准材料。

厦门艾思欧标准砂有限公司由中国材料工业科工集团公司、中国建筑材料科学研究总院、中国标准砂厂、福建省建材(控股)有限责任公司、广州建材企业集团有限公司五家股东单位共同出资兴建。公司坐落于厦门海沧投资区。

公司建立了高度自动化的标准砂生产线，通过严格的质量控制体系确保产品质量的长期稳定。公司获得国家标准样品授权证书，并通过ISO9001:2000质量管理体系认证。

公司标准砂的年生产能力为35000吨，产品出口到其他国家和地区。

Xiamen ISO Standard Sand Co., Ltd. was founded in 1999 and is the only enterprises designated by Chinese government to produce and sell China ISO Standard Sands. China ISO standard sand is produced according to ISO 679 and EN 196-1.

This company has been established and jointly funded by five stockholders of China National Materials Industry Group, China Building Material Academy, China Standard Sand Factory, Fujian Building Materials (Holding) Co., Ltd., and Guangzhou Building Materials Enterprise Group Co., Ltd. The plants of the company are located in Xiamen Haicang Investment Zone.

This company has highly automatic production lines of ISO Standard Sand and has established a perfect quality control system. It ensures the stable quality of China ISO Standard Sand through standardization of the flow of production and strict quality control. The company has passed ISO9001:2000 authentication to guarantee stable quality of product.

It's annual capability of China ISO Standard Sand is 35,000 tons, and the ISO Standard Sand produced by the company have been exported to other countries and regions.

厦门艾思欧标准砂有限公司
XIAMEN ISO STANDARD SAND CO., LTD.

厦门市海沧新阳工业区阳和路45号
45 Yanghe Rd. Xinyang Industry Zone.
Haicang, Xiamen, China 361022

Tel: +86-592-6517720
+86-592-6516880

Fax: +86-592-6517720
+86-592-6516860

Http://www.isosand.com
E-mail:sales@isosand.com



Reliable quality

Ability to guarantee long term supply

**Annual capacity - 35000tons,
The current raw material sand in stock can be used for 50 years at least.**

Less cost



CONTENTS

Volume 1

1. New Technology and Equipment for Cement Manufacturing

1.1	Advancement of Cement Science and Technology in China.....	3
	D. L. Xu, Y. X. Chen, H. Li (China)	
1.2	Theory and Practice of Cement Suspension Preheating and Precalcining Technology with High Solid -gas Mass Ratio	15
	D. L. Xu, H. Li, Y. X. Chen, F. A. Cheng (China)	
1.3	Three-dimensional Simulation of Gas Flow in a Cyclone with Volute Inlet.....	21
	Y. X. Chen, Y. Chen, D. L. Xu, N. C. Liu (China)	
1.4	Numerical Simulation of Hydrodynamic Behavior in Large-particle Fluidization Bed at High Temperature.....	26
	H. H. Fan, D. L. Xu, X. G. Li (China)	
1.5	The Composite Soil Stabilizer's Properties Experiment and Applications in Projects.....	33
	Y. L. Chen, W. L. You, Q. Liu, T. Ji (China)	
1.6	The Application of the K Type Internal Circulation Separator in the Cycle Flow Pulverizing System.....	39
	H. P. Liu (China)	
1.7	Research and Development on the Technology and Device for Purifying Flue Gas from Coal-burning Furnace.....	44
	Y. Xue, Y. Cheng, C. D. Wan, H. Y. Chen (China)	
1.8	On-line Particle Size Analysis in Cement Production: Industrial Instruments for Dry in-, on- and at-line Particle Size Analysis by Laser Diffraction Including Sampling and Dry Dispersion.....	51
	A. Pankewitz (Germany), J. F. Geng (China)	
1.9	Development and Application of HP Strong Vortex Type Multichannel Burner.....	57
	Q. S. Ding, S. Li (China)	
1.10	Development and Application of Wear Resistant Material for Cement Industry.....	64
	Y. Q. Lu, M. L. Li (China)	
1.11	Development of Separator Technology and Optimization of Large-sized Closed-circuit Grinding System.....	76
	Q. Zheng (China)	
1.12	The Developing Application in Cement Production Automation.....	86
	J. M. Wang (China)	
1.13	Application and Development of Metrological Technology for Powdery Material in Cement Plant.....	94
	G. B. Hou, S. Q. Lei, R. T. Xia (China)	

1.14	Research and Application of Flue Gas Cleaning Technology of Waste Incinerator.....	102
	Z. W. Mao, H. M. Wang, L. M. Sun (China)	
1.15	Research on Extending Service Life of Filter Bag of High-temperature Fiber Glass Bag Filter.....	111
	L. M. Sun, H. M. Wang, Z. W. Mao (China)	
1.16	System Scheme for Local Large Roller Press and Grinding Mill.....	117
	Y. L. Zhang, X. M. Wang, M. Y. Wang, Q. Q. Wang (China)	
1.17	Research on Jet-pulse Explosion-proof Bag Filter for Coal Mill.....	129
	L. Z. Tian, Q. Wang, P. A. Xu, Z. W. Mao, J. P. Hu (China)	
1.18	Application of Iron Tailings on New-type Dry Method Cement Production Line.....	138
	J. F. Li, X. Y. Liu (China)	
1.19	An Experimental Investigation on Pressure Drop and Collection Efficiency of Cyclone Separator with Different Inlet Vanes.....	145
	F. Zhao, Y. X. Chen, W. H. Liu, D. L. Xu (China)	

2. Portland Cement and Special Cement

2.1	The State-of-arts and Prospect of Cement and Concrete Industries in China.....	153
	M. S. Tang (China)	
2.2	Portland Cement Production and Greenhouse Gas Emissions During Its Manufacturing: A Global Review.....	159
	V. M. Malhotra (Canada)	
2.3	Improving the Sustainability of Portland Cement.....	163
	E. Marciano Jr, P.-C. Aïtcin (Canada)	
2.4	Sustainability Challenges in the Cement and Concrete Industry: With Particular Emphasis on Methods to Reduce CO ₂ Emission.....	169
	P. Jahren (Norway)	
2.5	New Technology of Portland Cement Clinker.....	180
	Y. A. Burlov, I. A. Burlov, Y. R. Krivoborodov (Russia)	
2.6	Ecological Problems of Cement Industry.....	184
	I. G. Abramson, L. G. Bernstein (Russia)	
2.7	Efficiency of EN 32.5 Type Blended Cement for 21st Century for General Use of Common Concrete.....	190
	S. Hanehara (Japan)	
2.8	The Crystal Lattice Constants Change and the Alite Polymorphs Transformation Induced by Doping Defects.....	203
	Z. F. Guan, Y. M. Chen, S. W. Qin, S. H. Guo, X. Y. Zhu (China)	
2.9	Influence of Thermal Activation of Row Mixes on Phase Composition and Microstructure of Clinker.....	210
	A. P. Osokin, Y. R. Krivoborodov, A. S. Ketov (Russia)	
2.10	Influence of CuO on the Mineral Formation of High Cementing Clinker.....	213
	S. H. Ma, X. D. Shen, X. P. Gong, B. Q. Zhong (China)	

2.11	Effect of TiO_2 on the Formation of Clinker with High C_3S	219
	H. X. Chen, X. Y. He, X. W. Ma, R. Fu, G. Q. Zhang (China)	
2.12	Study on the Burnability in the Formation of High C_3S Cement Clinker with Fluoride Sulphate Composite Mineraliser Used.....	224
	M. Z. Lan, L. L. Zhang (China)	
2.13	Effect of BaO on the Calcinations of High C_3S Clinker.....	230
	X. W. Ma, H. X. Chen, X. Y. He, R. Fu (China)	
2.14	Doping Effect of Alite in C_3S -rich Clinker and Preparation of High-strength Portland Cement Clinker.....	235
	S. H. Guo, X. Y. Zhu, S. W. Qin, Y. M. Chen (China)	
2.15	Study on Morphologies of Hydrates of High C_3S Content Cement Mixed with Coal Gangue at Various Temperature.....	242
	X. P. Liu, P. M. Wang, C. H. Xia (China)	
2.16	Development of New Technology for Production of Cement Clinker with Carbide Slag in Replacement of Limestone.....	249
	Q. S. Ding, G. H. Tang, S. B. Lu (China)	
2.17	The Mechanism Study of the Influence of Steel Slag Proportion on Raw Meal Burnability.....	258
	Z. J. Mi, S. H. An, L. R. Yang, Y. H. Liu, W. Zhang, K. R. Yang (China)	
2.18	Effect of Doped CuO on the Early Hydration of Tricalcium Silicate.....	264
	G. H. Hou, X. D. Shen, Z. Z. Xu (China)	
2.19	Clinkering Process and Microstructure Research on Alite-sulfoaluminate Portland Cement Clinker.....	268
	S. H. Guo, S. W. Qin, X. Y. Zhu, Y. M. Chen (China)	
2.20	Cement and Clinker——Determination of Ferric Oxide by o-phenanthroline Spectrophotometry.....	275
	Z. J. Ni, Y. G. Wen, S. Liu, J. Qiu (China)	
2.21	Development of Belite Based Cements in China.....	280
	Z. J. Wen, T. B. Sui, X. H. Zeng, J. Wang, L. Fan, Y. Liu (China)	
2.22	Properties of Strength and Heat Evolution of HBC.....	285
	J. Wang, T. B. Sui, X. H. Zeng, Z. J. Wen, L. Fan, Y. Liu (China)	
2.23	Researches on High Belite Cement and Its Concrete Durability.....	290
	L. Fan, Z. J. Wen, T. B. Sui, J. Wang, Y. X. Yang, S. H. Chen, S. J. Zhang, W. Zhong, Y. Liu (China)	
2.24	The Manufacture and Properties of Low Heat Portland Cement.....	296
	H. L. Xu, Y. H. Hou, A. P. Qin, D. S. Liu, S. S. Liu, T. B. Sui, Z. J. Wen, J. Wang, L. Fan (China)	
2.25	Influence of MgO and Gypsum on the Properties of Alite-calcium Barium Sulphoaluminate Cement.....	302
	W. Zhang, X. J. Tang, L. C. Lu, Z. M. Ye, L. B. Yu (China)	
2.26	Influence of SO_3 , BaO and CaF_2 on Calcination and Performances of Alite-calcium Barium Sulphoaluminate Cement	308
	L. C. Lu, Y. Q. Shen, M. Zuo, J. Chang, X. Cheng (China)	
2.27	A Discussion on Causes and Mechanism of Paste Flash Setting	314
	Y. Z. Xi (China)	

2.28	Analysis of Initial Hydration and Structure Formation of Portland Cement by Heat-electric Model.....	320
	R. Z. Dong, B. G. Ma, H. B. Zhu, Y. H. Xu, J. Wei (China)	
2.29	Double-critical Effect of Setting Retarder on the Hydration and Hardening of High Cementitious Cement.....	327
	R. Z. Dong, B.G. Ma, Y. H. Xu, H. B. Zhu, J. Wei (China)	
2.30	Test Method for Linear Thermal Expansion Coefficient of Cement Paste.....	332
	C. X. Qian, S. W. Ding, D. P. Chen, X. T. Wang, M. Li, C. Chen (China), P. Stroeven, Z. Q. Guo (The Netherlands)	
2.31	Fundamental Study on the Chemical Stability of Hardened Pastes of Phosphoaluminate Cement.....	337
	S. Q. Li, Z. H. Yi, F. W. Zhao, B. Liu, J. S. Hu (China)	
2.32	Influence of Particle Shape of Cement on Its Properties.....	343
	X. Wang, X. M. Bai, C. Liu, L. Z. Jiang, Z. M. Xiao (China)	
2.33	Study on Adsorption Characteristic of Cement-based Materials.....	350
	Z. H. Shui, C. H. Shen (China)	
2.34	A Comparison of Mortars Strengths of Blended Cements with Two Kinds of Different Hydration Activity and Different Particles Size Mineral Additives.....	356
	S. X. Zhou, Y. M. Chen, W. S. Zhang (China)	
2.35	Performance of Energetically Modified Cement (EMC) and Highly Reactive Pozzolan Based on Fly Ash.....	361
	H. Justnes (Norway), V. Ronin J.-E. Jonasson (Sweden)	
2.36	Effect of Fluorine-rich Slag on Properties of Slag Cement.....	370
	Z. H. Zhou, X. Cheng, J. Chang, S. F. Huang, L. C. Lu, Z. M. Ye (China)	
2.37	Study on Performance of Slag-PC-C \bar{S} A System Cement.....	375
	S. P. Cui, H. Y. Yu, Y. L. Wang, Z. M. Wang, Y. Zhang (China)	
2.38	The Research on High Strength Cement Compounded with Superfine Powder of Limestone and GGBS.....	380
	D. K. Zhang, Q. X. Zhao (China)	
2.39	The Relationship between Shrinkage of Blast Furnace Slag Cement and Components of Hardened Cement Pastes.....	386
	Q. Song, D. L. Xu, X. K. Hou, H. Li (China)	
2.40	Effect of Waste Bottle Glass Powders on the Hydration, Strength Development and Pore Structure of Portland Cement Pastes.....	392
	K. Asaga, H. Kuga, M. Sakamoto (Japan)	
2.41	Study on Hydration Process of Cement Clinker Minerals Prepared by Sol-gel Method with ESEM-FEG.....	398
	P. M. Wang, X. P. Liu (China)	
2.42	Characteristics of Rapid-hardening Mortar Added with Amorphous Calcium Aluminate.....	406
	M. Morioka, R. Yoshino, T. Higuchi, K. Igarashi (Japan)	
2.43	Research on Early Hydration of Cement with Thermal Activated Coal Gangue.....	411
	W. Guo, J. P. Zhu, D. X. Li, J. H. Chen, N. R. Yang (China)	

2.44	Hydration Process and Pore Structure of Portland Cement Paste Blended with Blastfurnace Slag.....	417
	J. Zhou (the Netherlands), G. Ye (Belgium), K. Van Breuge (The Netherlands)	
2.45	Investigation of Water-reducing Agents on the Early Hydration of High C ₃ S Content Portland Cement.....	425
	B. G. Ma, Y. H. Xu, R. Z. Dong (China)	
2.46	Study on Calcium Silicate Hydrates Containing Naphthalene-type Superplasticizer by X-ray Photo Electron Spectroscopy.....	430
	H. X. Wang, W. S. Zhang, J. Y. Ye (China)	
2.47	Results of a Complex Study of Cement Hydration and Ageing Products and Their Implications	434
	E. T. Stepkowska (Poland), M. A. Aviles, J. M. Blanes (Spain), J. E. Hebanowska (Poland), C. Real, M. J. Sayagues, J. L. Perez-Rodriguez (Spain)	
2.48	Study on Relationship of Microstructure, Phases Percolation and Macro-performance of Cement-based Materials: Part I: Development of Cement-based Materials Microstructure Model Based on Percolation Theory.....	441
	X. Y. He, Y. M. Chen, Y. Su (China)	
2.49	Study on Relationship of Microstructure, Phases Percolation and Macro-performance of Cement-based Materials: Part II: Analysis of Strength of Cement-based Materials and Construction of Porosity-strength Model Based on Pore Percolation.....	447
	X. Y. He, Y. M. Chen, Y. Su (China)	
2.50	Study on Relationship of Microstructure, Phases Percolation and Macro-performance of Cement-based Materials: Part III: Analysis of Admixture Effect of Mineral Admixtures.....	454
	Y. M. Chen, X. Y. He, Y. Su (China)	
2.51	The Influence of Slag Particle Size Distribution to the Pore Structure and Mechanics Performance of Slag Cement System in Early Period.....	459
	P. Zhao, D. L. Xu, X. G. Li (China)	
2.52	The Effect of Elevated Temperatures on the Composition and Structure of Blended Cement Pastes and Mortars.....	465
	G. Kakali, R. Leventi, V. Benekis, S. Tsivilis (Greece)	
2.53	Investigation on Relationship between Fabric and Hydration Behavior with Combined Resistivity-heat Release Method.....	472
	Z. He, Q. Luo, W. Q. Liang, H. Q. Yang (China)	
2.54	Electrical Measurement to Assess Hydration Process and the Porosity Formation.....	481
	X. S. Wei, L. Z. Xiao, Z. J. Li (China)	
2.55	Engineering the Nano- and the Meso-scale Bonding Scheme in Neat and Hybrid Cement Hydrates.....	490
	Ahmed Gmira (France, Norway), Jérôme Minet, Alexandre Francischini, Nicolas Lequeux, Bruno Bresson, Roland J.-M. Pellenq, Henri Van Damme (France)	
2.56	Research of Properties and Hydration Mechanisms of Portland Cement and Calcium Aluminate Cement Compound System.....	497
	G. Z. Diao, G. H. Liu, Z. X. Wang (China)	
2.57	Corrosion Resistance of Bittern-resisting Cement in Brine.....	505
	B. W. Wang, Y. B. Hou (China)	