

## PREFACE

It is a great pleasure that we introduce this special issue of Advanced Materials Research (AMR) containing 59 papers selected from 400 papers presented at the 7th International Conference on Advanced Materials Development and Performance (AMDP2014). The conference was held at Korea Maritime and Ocean University in Busan, Korea from 17 to 20 July 2014 and the seventh in this series attracting a broad range of international and researchers in various fields.

The Conference of AMDP is rich in history and now in its seventh series of existence. It has been held on a three-year cycle with a long tradition, starting in 1997 - Auckland (New Zealand), 1999 – Tokushima (Japan), 2002 – Daegu (Korea), 2005 – Auckland (New Zealand), 2008 – Beijing (China) and 2011 – Tokushima (Japan). This conference was initiated by a network researchers and engineers both from academia and industry in the area of advanced materials.

The key aim of AMDP2014 is to provide an opportunity for the delegates to meet, interact and exchange new ideas on advanced materials development, performance and their applications. This conference covers a wide range of topics related to materials science and engineering.

About 400 papers from 11 countries were submitted in this conference, only a few manuscripts have been selected for publication in AMR. Selected papers for this issue of AMR are those that represent innovative and leading work in the development field. Other papers from AMDP2014 are published in Advanced Materials Research which is indexed by SCOPUS.

It is my hope as a guest editor that this issue will simulate further discussion and additional research in this area so that in the future such a topical issue might include a range of empirical studies. I am grateful to all of the authors who contributed to the issue, all AMDP2014 participants and whole staff for their contribution

Yun-Hae Kim



Chairman of AMDP2014  
Korea Maritime and Ocean University  
Korea

## AMDP2014 : International Advisory Committee

### *Chair,*

Kim, Y.H. Prof, Korea Maritime and Ocean Univ. Korea

### *Members,*

|                |   |             |
|----------------|---|-------------|
| Chiu, S.H.     | Prof, National Taiwan Univ. of Science and Technology | Taiwan      |
| Ferguson, W.G. | Prof, The Univ. of Auckland                           | New Zealand |
| More. M.A.     | Prof, Univ. of Pune                                   | India       |
| Murakami, R.   | Prof, National Taiwan Univ. of Science and Technology | Taiwan      |
| Song, X.P.     | Prof, Xi'an Jiaotong Univ.                            | China       |
| Suh, C.M.      | Prof, Kyungpook National Univ.                        | Korea       |
| Yoon, H.K.     | Prof, Dongeui Univ.                                   | Korea       |

## AMDP2014 : International Technical Committee

### *Chairs,*

|                 |  |             |
|-----------------|--|-------------|
| Kim, T.G.       | Prof, Pusan National Univ.                 | Korea       |
| Ding, B.J.      | Prof, Xi'an Jiaotong Univ.                 | China       |
| Gao, W.         | Prof, The Univ. of Auckland                | New Zealand |
| Mark, F.        | Prof, Hong Kong Industrial Research Center | Hong Kong   |
| Moriga, T.      | Prof, The Univ. of Tokushima               | Japan       |
| Niu, J.         | Prof, Harbin Institute of Technology       | China       |
| Ramakrishna, S. | Prof, National Univ. of Singapore          | Singapore   |

### *Members,*

|  |  |
|--|--|
| Alyamani, A.(Dr, KACST, SA)                        | Bhalerao, A.(Prof, Bharati Vidyapeeth Univ, IN)  |
| Bae, D.H.(Prof, Sungkyunkwan Univ., KR)            | Bae, J.Y.(Prof, Keimyung Univ., KR)              |
| Bhattacharyya, D.(Prof, The Univ. of Auckland, NZ) | Chakane, S.D.(Dr, Univ. of Pune, IN)             |
| Chen, C.M.(Prof, Southern Taiwan Univ., TW)        | Chen, Z.(Prof, Auckland Univ. of Technology, NZ) |
| Cheng, Y.B.(Prof, Monash Univ., AU)                | Cheong, W.C.( Prof, National Taiwan Univ., TW)   |
| Cho, H.(Prof, Pusan National Univ., KR)            | Conor, P.(Mr, Defence Technology Agency, NZ)     |
| Gabbitas, B.(Prof, Univ. of Waikato, NZ)           | Gao, J.R.(Prof, Northeastern Univ., US)          |
| Gong, S.K.(Prof, Beihang Univ., CN)                | Hao, G.(Prof, Nat'l Univ. of Singapore, SG)      |
| He, Y.D.(Prof, USTB, CN)                           | Hodgson, M.(Dr, The Univ. of Auckland, NZ)       |
| Huang, W.G.(Prof, Sichuan Univ., CN)               | Hur, S.C.(Prof, Gyeongsang Nat'l Univ., KR)      |
| Jan, M.(Prof, National Taiwan Univ., TW)           | Jones, M.(Dr, The Univ. of Auckland, NZ)         |

Jung, Y.G.(Prof, Changwon National Univ., KR)

Kennedy, J.(Dr, Institute of Geological and Nuclear Sciences, NZ)

Kim, J.H.(Prof, Chungnam National Univ., KR)

Kim, K.Y.(Prof, Korea Univ. of Technology and Education, KR)

Kim, S.S.(Prof, Kyungpook Nat'l Univ., KR)

Shin, D.C.(Prof, Kaje College, KR)

Koinkar Pankaj (Dr, The Univ. of Tokushima, JP)

Kumar Rangari, V.(Prof, Tuskegee Univ., US)

Lee, C.S.(Prof, Keimyung Univ., KR)

Lee, H.R. (Prof, Kyungpook National Univ., KR)

Lee, J.Y.(Prof, National Taiwan Univ. of Science and Technology, TW)

Lee, Y.S.(Prof, Chungnam Nat'l Univ., KR)

Li, L.(Prof, Nat'l Univ. of Singapore, SG)

Li, S.X.(Prof, IMR-Chinese Academy of Sciences, CN)

Liang, S.H.(Prof, Xi'an Univ. of Technology, CN)

Lin, H.R.(Prof, Southern Taiwan Univ., TW)

Liu, A.M.(Prof, Dalian Univ. of Technology, CN)

Mahajan, J.R. (Dr, Univ. of Mumbai, IN)

More, M. A.(Prof, Univ. of Pune, IN)

Mohite, K. C.(Dr, Univ. of Pune, IN)

Nahm, S.H.(Prof, Korea Research Institute of Standards and Science, KR)

Patil, A.V.(Dr, Univ. of Pune, IN)

Qi, M.(Prof, Dalian Univ. of Technology, CN)

Reeves, R.(Prof, Univ. of Canterbury, NZ)

Shirsat, M.D.(Prof, Dr, B. A. M. Univ., IN)

Takagi, H.(Prof, The Univ. of Tokushima, JP)

Wang, Q.Y.(Prof, Sichuan Univ., CN)

Wei, Y.H.(Prof, Taiyuan Univ. of Technology, CN)

Yang, J.R.(Prof, National Taiwan Univ., TW)

Yonekura, D.(Prof, The Univ. of Tokushima, JP)

Yu, C.Y.(Prof, National Taiwan Univ. of Science and Technology, TW)

Zhang, J.X.(Prof, Xi'an Jiaotong Univ., CN)

Zhou, C.G.(Prof, Beihang Univ., CN)

Kanesaki, A.(Prof, The Univ. of Tokushima, JP)

Kim, J.D.(Prof, Korea Maritime and Ocean Univ., KR)

Kim, J.Y.(Prof, Korea Maritime and Ocean Univ., KR)

Kim, S.J.(Prof, Pukyong National Univ., KR)

Jung, Y.C.(Dr, Deagu Mechatron. & Materials Institute, KR)

Kale, B.B.(Dr, C-MET, IN)

Kral, M.(Prof, Univ. of Canterbury, NZ)

Kwon, J.D.(Prof, Yeongnam Univ., KR)

Lee, D.M.(Prof, Tongmyung Univ., KR)

Lee, H.S.(Prof, Dong-A Univ., KR)

Lee, T.K.(Prof, Gyeongsang Nat'l Univ., KR)

Li, J.G.(Prof, Lanzhou Univ., CN)

Li, S.(Prof, Univ. of New South Wales, AU)

Li, Z.W.(Dr, Building Research Association of New Zealand, NZ)

Lim, J.K.(Prof, Chonbuk Nat'l Univ., KR)

Lin, K.M.(Prof, Southern Taiwan Univ., TW)

Liu, S.G.(Prof, Nankai Univ., CN)

Metson, J.(Prof, The Univ. of Auckland, NZ)

More, P.S.(Dr, Univ. of Mumbai, IN)

Moon, K.M.(Prof, Korea Maritime and Ocean Univ., KR)

Ngan, A.(Prof, Univ. of Hong Kong, HK)

Park, W.J.(Prof, Gyeongsang Nat'l Univ., KR)

Qiao, G.J.(Prof, Xi'an Jiaotong Univ., CN)

Seo, C.M.(Prof, Kyungpook Nat'l Univ., KR)

Shelke, P.N.(Dr, Univ. of Pune, IN)

Wang, C.H.(Prof, National Taiwan Univ. of Science and Technology, TW)

Wang, X.S.(Prof, Tsinghua Univ., CN)

Xu, W.H.(Prof, Xi'an Univ. of Architecture and Technology, CN)

Yang, Z.M.(Prof, Xi'an Jiaotong Univ., CN)

Yoon, H.K.(Prof, Dongeui Univ., KR)

Zhang, D.(Prof, Univ. of Waikato, NZ)

Zhang, Q.(Prof, Nat'l Taiwan Univ., KR)

Zhou, S.J.(Prof, Shandong Univ., CN)

## AMDP2014 : International Executive Committee

### *Chair,*

Lee, B.W.      Prof, Korea Maritime and Ocean Univ.      Korea

### *Members,*

|   |  |
|---|--|
| Eum, W.S.(Prof, Yonsei Univ., KR)           | Jung, J.M.(Prof, Inha Univ., KR)                     |
| Hur, S.C.(Prof, Gyeongsang Nat'l Univ., KR) | Moon, K.M.(Prof, Korea Maritime and Ocean Univ., KR) |
| Jo, Y.D.(Dr, SK Chemical, KR)               | Jung, S.H.(Prof, Korea Maritime and Ocean Univ., KR) |
| Kim, J.W.(Prof, KAIST, KR)                  | Kim, J.Y.(Prof, Korea Maritime and Ocean Univ., KR)  |
| Kim, K.H.(Prof, Tong Myung Univ., KR)       | Kim, Y.H.(Prof, Gyeongnam Univ., KR)                 |
| Lee, D.M.(Prof, Tong Myung Univ., KR)       | Lee, J.H.(Prof, Jeju Nat'l Univ., KR)                |
| Lee, K.Y.(Prof, Korean Naval Academy, KR)   | Lee, S.W.(Dr, Research Center, KR)                   |
| Park, J.C.(Prof, Pusan Nat'l Univ., KR)     | Park, S.H.(Prof, KAIST, KR)                          |
| Shin, D.H.(Dr, Korean Air Line, KR)         | Song, C.Y.(Prof, Mokpo Nat'l Univ., KR)              |
| Yoon, H.G.(Prof, Changwon Nat'l Univ., KR)  | Yu, S.C.(Prof, POSTECH, KR)                          |

## AMDP2014 : Local Organizing committee

### *Chairs,*

|            |                                      |       |
|------------|--------------------------------------|-------|
| Choi, H.S. | Prof, Korea Maritime and Ocean Univ. | Korea |
| Kim, J.D.  | Prof, Korea Maritime and Ocean Univ. | Korea |

### *Members,*

|                 |                   |                  |
|-----------------|-------------------|------------------|
| Hur, S.C., Prof | Hwang, K.I., Prof | Jung, S.H., Prof |
| Kim, J.Y., Prof | Kim, Y.H., Prof   | Lee, B.W., Prof  |
| Park, C.W., Mr  | Park, S.H., Prof  | Jeong, W. R., Dr |
| Park, S. J., Ms | Lee, S.J., Prof   | Jung, M. K., Mr  |

## AMDP2014 : Secretary General

Hwang, K.I.      Prof, Korea Maritime and Ocean Univ.      Korea

## AMDP2014 : Secretary Board

|  |   |
|--|---|
| Ha, J.C.(Dr, Korea Maritime and Ocean Univ., KR)     | Lee, J.W.(Mr, Korea Maritime and Ocean Univ., KR) |
| Jung, S.H.(Prof, Korea Maritime and Ocean Univ., KR) | Joo, M.J.(Ms, Korea Maritime and Ocean Univ., KR) |

# BEST F.A

(Sponsorship)

**BEST F.A CO., LTD.**

BEST EASY SIMPLE TECHNOLOGY  
FACTORY AUTOMATION

\*\*\*Energy Saving, Better Nature\*\*\*



Best Easy Simple Technology Factory Automation. BEST F.A CO., LTD. has made effort to spread new advanced welding technology and welding automation in Korea. By searching and introducing excellent welding equipment & technology, we have contributed to the establishment of root industry for the competitive technology in the field of automotive, shipbuilding,

and heavy industries.

We, as the only official partner of Fronius in Korea, have tried to introduce and expand state-of-the-art equipment & technology for the improvement of welding technology & quality in Korea.

For the full range of service in nonferrous metal welding, we have been supplied exclusively not only welding equipment but also high quality of wire from Europe and Japan, and we provide outstanding service so that the latest technology can be applied in Korea's industry. We will do our best to provide high-quality raw materials and technology so that Korea will have one of the most competitive industries in the entire world.



# ***GOOD SOLUTIONS FOR YOUR WORK PLACES***

IENTECO is a renowned company specialized in designing and manufacturing of chip conveyor, centralized chip & coolant system, and high precision filtering system. With more than 30 years of experience and skilled engineers, we offer total solutions in field of automotive, machine tool, aviation industry and many others.

Today companies all over the world are using equipment from IENTECO. In pursuit of customer centered service, we will take the lead in R&D activities, quality improvement and technical training.

**ECO FRIENDLY,  
GREEN GROWTH,  
MASTERPIECE PURSUIT**

**IENTECO systems and solutions**

CENTRALIZED CHIP PROCESSING & COOLANT SYSTEM

HIGH PRECISION FILTERING SYSTEM( $1\text{ }\mu\text{m} \sim 5\text{ }\mu\text{m}$ )

VACUUM PAPER FILTER COOLANT SYSTEM

CHIP BRIQUITTER & COOLANT RECOVERY SYSTEM

PUMP BACK COOLANT SYSTEM



**SLUDGE OIL REMOVAL & RECOVERY MACHINE**



**CHIP CONVEYOR**



**AL BRIQUITTER**



**2STORY DRUM FILTER**



**VACUUM PAPER FILTER**

**IENTECO.,LTD.** [www.ienteco.com](http://www.ienteco.com)

(641-921) 24-30, Gasulsannam-ro, Daesan-myeon, Ulchang-gu, Changwon-si, Gyeongsangnam-do, Republic of Korea.

Tel : +82-55-293-9798, 82-55-294-9798 Fax : +82-55-295-9789 E-mail : [enteco@chol.com](mailto:enteco@chol.com)

# DONGDO BASALT IND.CO., LTD.

## (Sponsorship)



In the past, Korean construction industry had to import almost every basalt product from overseas, and basalt products were considered to be highly priced because of the import cost.

We at Dongdo Basalt have broken down the price barrier by successfully developing a complete basalt product manufacturing technology.

Our basalt product quality has been applauded by many partners such as POSCO, one of the biggest steel manufacturing and process industry leaders in the world, Korea Electronic Power Corporation (hydraulic, thermal, and nuclear power), and glass and cement manufacturers that require abrasion-resistant materials.

Remember, you just have opened a new chapter of abrasion resistant materials history by choosing us to be your business partner.

We will continuously do our best to improve our basalt product quality, so we can meet your needs, and promise to keep your company competitive in the market along with us by manufacturing the highest-quality products at the lowest price.

### ■ Cast Basalt

**Cast basalt is made from natural basalt, a type of lava that is melted inside a melting furnace at approximately 1280°C, and shaped into tiles, tubes, or other desired shapes with metallic or sand patterns at a temperature of 1200°C. Then it is re-crystallized with special heat treatment process to reinforce its resistance against abrasion, corrosion, and shock**



**DONGDO BASALT IND CO., LTD.** [www.dongdobasalt.co.kr](http://www.dongdobasalt.co.kr)

127-1, DuRyu-Ri, An-Gang Eup, Kyoung-Ju, Gyeongsangbuk-do, Republic of Korea.  
Tel : +82-54-763-6000~4 Fax : +82-54-763-6005 E-mail : basalt0621@hanmail.net