Preliminary Technical Program

Beneficiation of Phosphates VII
An ECI Conference Series
March 29-April 3, 2015
Melbourne, Australia

Chair
Dr. Patrick Zhang
Florida Industrial and Phosphate Research Institute

Co-Chairs
Professor Jan Miller
University of Utah, USA
Dr. Julian Hilton
Aleff Group, United Kingdom
Professor Laurindo Leal Filho
University of Sao Paulo/Vale, Brazil
Dr. Abdelaâli Kossir
OCP Group, Morocco
Mr. Ewan Wingate
WorleyParsons Services Pty Ltd, Australia

ECI
Engineering Conferences International
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Sunday, March 29, 2015

16:00 - 19:00 Conference check-in
18:00 - 19:00 Welcome Reception
19:00 - 21:00 Dinner
Monday, March 30, 2015

06:30 - 08:30  Breakfast

**Opening Remarks**

08:30 - 08:35  Patrick Zhang, Florida Industrial and Phosphate Research Institute, USA

**Welcoming Remarks**

08:35 - 08:45  Ewan Wingate, WorleyParsons Services Pty Ltd., Australia

**Session I: Comprehensive Extraction**

**Session Co-Chairs:** Abdelaali Kossir, OCP Group, Morocco  
Gary Albarelli, Florida Industrial and Phosphate Research Institute, USA

**Keynote 1:**

08:45 - 09:25  Smart, sustainable development of phosphate resources: The prospects of phosphogypsum utilization and uranium recovery  
Julian Hilton, Aleff Group, United Kingdom

09:25 - 09:55  Recovery of REE from an apatite concentrate in the nitrophosphate process of fertilizer production  
Kerstin Forsberg, Royal Institute of Technology (KTH), Sweden

09:55 - 10:25  There and back again 2.5: Who did what in solvent extraction - a demonstrated and proven technology for uranium recovery from phosphoric acid  
Vaughn Astley, Dr Phosphate, Inc., USA

10:25 - 10:55  Coffee break

10:55 - 11:25  Enrichment of rare earth elements from Florida phosphate flotation tailings  
Wending Xiao, China University of Geosciences, China

11:25 - 11:55  Pre-treatment and leaching of an Australian rare earth ore – A chemical and mineralogical assessment  
Robbie McDonald, CSIRO, Australia

11:55 - 12:25  Rare earths and the recovery of administratum from phosphates  
Vaughn Astley, Dr Phosphate, Inc., USA

12:25 - 12:55  Upgrading phosphate flotation tailings for rare earths extraction  
Salah Al-Thyabat, Al-Hussein Bin Tall University, Jordan

12:55 - 14:15  Lunch
Monday, March 30, 2015 (continued)

**Session II: Process Innovation**

**Session Co-chairs:** Laurindo Leal Filho, Vale, Brazil
Arafat Ghosheh, Saudi Arabian Mining Co. Ma’Aden, Saudi Arabia

**Keynote 2:**

14:30 - 15:15
Hydrophobic interactions in fine particle separation
Roe-Hoan Yoon, Virginia Tech, USA

15:15 - 15:45
Bench-scale beneficiation experiment on Congo’s Hinda phosphate ore
Wengyi Song, China Bluestar Lehigh Company, China

15:45 - 16:15
Tenova Bateman technologies: Tailor made approaches for mechanical beneficiation of phosphate rock
Leonid Lisiansky, Tenova Bateman Technology, Israel

16:15 - 16:45
Coffee break

16:45 - 17:15
Water quality effect in phosphate flotation: Understanding leads to overcoming
Lucas R. Moore, ArrMaz, USA

17:15 - 17:45
An alternative flotation process for apatite concentration of the Itataia carbonaceous uranium-phosphate ore
Elves Matiolo, Centro de Tecnologia Mineral, Brazil

17:45 - 18:15
Study on mineral processing of a medium to low grade phosphate ore
Mei Yang, China University of Geosciences, China

18:15 - 18:45
Application of pico-nano bubble generator in phosphate reverse flotation
Yu Xiong, ArrMaz Custom Chemicals, USA

19:00 - 21:00
Dinner

21:00 - 22:00
Social Hour
**Tuesday, March 31, 2015**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session/Event</th>
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<tbody>
<tr>
<td>06:30 - 08:30</td>
<td>Breakfast</td>
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<tr>
<td><strong>Session III: Flotation Reagents</strong></td>
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<td><strong>Session Co-Chairs:</strong> Chaucer Hwang, Mosaic Company, USA</td>
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<td>Gerald Heebner, Arizona Chemicals, USA</td>
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<td>08:30 - 09:15</td>
<td><strong>Keynote 3:</strong> Phosphate beneficiation: Technological challenges and advances</td>
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<td>Ponisseril Somasundaran, Columbia University, USA</td>
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<td>09:15 - 09:40</td>
<td>Application of Custofloat® carbonate collectors in beneficiating phosphate ores in China</td>
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<td>Guoxin Wang, ArrMaz, USA</td>
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<td>09:40 - 10:05</td>
<td>Processing Florida dolomitic phosphate pebble with Custofloat® carbonate collectors</td>
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<td>Guoxin Wang, ArrMaz, USA</td>
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<td>10:05 - 10:35</td>
<td><strong>Coffee break</strong></td>
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<tr>
<td>10:35 - 11:00</td>
<td>Improvement of dolomite collector on high magnesium pebble sample from Florida</td>
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<td>Chunhui Feng, China Bluestar Lehigh Engineering Corp., China</td>
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<td>11:00 - 11:25</td>
<td>Opportunities for flocculation/flotation treatment of phosphate slimes using temperature responsive reagents</td>
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<td>Elizaveta Forbes, CSIRO, Australia</td>
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<td>11:25 - 11:50</td>
<td>Evaluation of traditional phosphate flotation reagent on the beneficiation of low grade igneous phosphate ore</td>
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<td>Patrick Laflamme, Corem, Canada</td>
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<td>11:50 - 12:15</td>
<td>Phosphate beneficiation with novel collectors for direct and reverse flotation: Beyond low cost fatty acids</td>
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<td>Pablo Dopico, Clariant Mining Solutions, USA</td>
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<td>12:15 - 12:40</td>
<td>The use of lanthanum (La+3) and cerium (Ce+3) ions as phosphate activators in low grade phosphate flotation</td>
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<td>Salah Al-Thyabat, Al-Hussein Bin Talal University, Jordan</td>
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<td>12:40 - 14:15</td>
<td><strong>Lunch</strong></td>
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<td>14:15</td>
<td>Optional excursion(s)</td>
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<td>19:00</td>
<td>Dinner on own</td>
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Wednesday, April 1, 2015

06:30 - 08:30  Breakfast

Session IV: Processing Equipment
Session Co-Chairs: Jaisen Kohmuench, Eriez Flotation Division, USA
                 Abdelhak Kabbabi, OCP Group, Morocco

Keynote 4:
08:30 - 09:15  Advances in particle characterization for improved mineral processing technology
               Jan Miller, University of Utah, USA

09:15 - 09:45  Column flotation of phosphate ore – An engineer’s perspective
               Ewan Wingate, WorleyParsons, Australia

09:45 - 10:15  Phosphate In Australia – So Near Yet So Far
               Ewan Wingate, Worleyparsons, Australia

10:15 - 10:45  Coffee break

10:45 - 11:15  Gravitational separation behavior of collophanite from dolomite in a packed column jig
               Wending Xiao, China University of Geosciences, China

11:15 - 11:45  Pilot testing and feasibility analysis of deep cone thickening for Florida phosphate clay (slime)
               Chaucer Hwang, The Mosaic Company, USA

11:45 - 12:15  Application of classification and fluidized-bed flotation at PCS aurora
               Jaisen Kohmuench, Eriez Flotation Division, USA

12:15 - 12:45  Understanding the comminution mechanism of high-pressure grinding rolls: Lower cost, higher efficiency and selectivity
               Francisco Sotillo, PerUsa EnviroMet, Inc., USA

12:45 - 14:15  Lunch

14:15          Group tour

19:00 - 21:00  Dinner

21:00 - 22:00  Social Hour
Thursday, April 2, 2015

06:30 - 08:30 Breakfast

**Session V: Hydrometallurgy**

**Session Co-Chairs:** Vaughn Astley, Dr. Phosphate, Inc., USA
Tibaut Theys, Prayon Technologies, Belgium

**Keynote 5:**

08:30 - 09:15 Research progress on the production of industrial phosphoric acid and downstream phosphates from wet-process phosphoric acid in China
Yuanxin Wu, Wuhan Institute of Technology, China

09:15 - 09:45 Newcomer in phosphoric acid process routes the DA-HF process ensures 2 to 3 % of efficiency increase compared to a standard dihydrate plant with a limited number of extra equipment
Tibaut Theys, Prayon Technologies, Belgium

09:45 - 10:15 Influence of crystalinity and dissolution kinetics on apatite flotation response with sodium oleate
Laurindo Leal Filho, Vale Technological Institute, Brazil

10:15 - 10:45 Coffee break

10:45 - 11:15 Alloy 31 lining in hemihydrate reactors
John Pannia, IPL Phosphate Hill, Australia

11:15 - 11:45 \( \text{P}_2\text{O}_5 \) reclamation from gypsum sacks
Casey R. Hiette, IPL Phosphate Hill Operations, Australia

11:45 - 12:15 Improvement of valves and pumps for the phosphoric reactor circuit.
Matthew Johnson, Incitec Pivot Limited, Australia

12:15 - 12:45 Environmentally friendly, energy efficient slurry handling by MULTISAFE double hose-diaphragm pumps
Rudolf Gänsl, FELUWA Pumpen GmbH, Germany

12:45 - 14:15 Lunch
Thursday, April 2, 2015 (continued)

Session VI: Waste Utilization and the Environment
Session Co-Chairs: Julian Hilton, Aleff Group, United Kingdom
Salah Al-Thyabat, Al-Hussein Bin Talal University, Jordan

15:00 - 15:30  Overcoming the regulatory hurdles to recovering rare earths from phosphate
Gary Albarelli, Florida Industrial and Phosphate Research Institute, USA

15:30 - 16:00  An optimized approach to phosphate recovery
Jaisen Kohmuench, Eriez Flotation Division, USA

16:00 - 16:30  Recovery of rare earths from Florida phosphogypsum
Patrick Zhang, Florida Industrial and Phosphate Research Institute, USA

16:30 - 17:00  Coffee break

17:00 - 17:30  Environmental protection: An imperative of sustainable development in phosphate industry
Abdelhak Kabbabi, OCP Group S.A., Morocco

17:30 - 18:00  Phosphorus removal and recovery from waste water by bio-processing followed by microwave radiation
Renhua Zhong, Wuhan Phosphorus Resources Science and Technology Development Co Ltd, China

18:00 - 18:30  Recovery of sulphur values from phosphogypsum: A historical review and prospects for the future
Gary Albarelli, Florida Industrial and Phosphate Research Institute, USA

19:30 - 22:00  Banquet
Friday, April 3, 2015

06:30 - 08:30 Breakfast

Session VII: Analysis and Control
Session Co-Chairs: Wending Xiao, China University of Geosciences, China
Michael Gaft, Laser Distance Spectrometry (LDS), Israel

09:00 - 09:25 ReLIBS (Remote Laser Induced Breakdown Spectroscopy) – Industrial online analyzer for phosphate industry
Michael Gaft, Laser Distance Spectrometry (LDS), Israel

09:25 - 09:50 The use of advanced process controls in a phosphoric acid reactor
Vaughn Astley, Dr Phosphate, Inc., USA

09:50 - 10:15 Coffee break

10:15 - 10:40 Suitability of Geoscan-M elemental analyser for phosphate rock
Derek Griffiths, Scantech International Pty Ltd, Australia

10:40 - 11:05 The impact of an increase in potassium content in the rock feed on the operation of the Phosphate Hill hemihydrate phosphoric acid plant.
Gerhardus C. Du Plessis, Incitec Pivot Ltd, Australia

11:05 - 11:30 Optimization of Jordanian phosphate flotation by artificial neural network (ANN)
Ryan D, Jordan Phosphate Mines Company, Jordan

11:30 - 11:55 Recovery of sulphur values from phosphogypsum: A historical review and prospects for the future
Gary Albarelli, Florida Industrial and Phosphate Research Institute, USA

12:00 Lunch and departures