Program

Beneficiation of Phosphates VIII
An ECI Conference Series

April 29 – May 4, 2018
Cape Town, South Africa

Chair
Dr. Patrick Zhang
FIPR Industrial and Phosphate Research Institute
Florida Polytechnic University

Co-Chairs
Professor Jan Miller
University of Utah, USA

Professor. Laurindo Leal Filho
University of Sao Paulo, Brazil

Dr. Neil Snyders
Stellenbosch Univ., South Africa

Mr. Marius Porteus
Foskor, South Africa

Mr. Ewan Wingate
WorleyParsons, Australia

Professor Guven Akdogan
Stellenbosch Univ., South Africa

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Wending Xiao, Wuhan Inst. of Technology
Xiang Yang, China Univ. Geosciences
Zeqiang Zhang, Wuhan Institute of Technology
**Previous conferences in this series:**

*Beneficiation of Phosphates: Theory and Practice*
  December 5-10, 1993
  Palm Coast, Florida
  Conference Chairs:
  Ronald Wiegel, IMCF
  Hassan El-Shall, Florida Institute Phosphate Research, USA
  Brij Moudgil, University of Florida, USA

*Beneficiation of Phosphates II*
  December 6 - 11, 1998
  Palm Coast, Florida
  Conference Chairs:
  Patrick Zhang, Florida Institute of Phosphate Research, USA
  Ronald Wiegel, University of Minnesota, USA
  Hassan El-Shall, Florida Institute Phosphate Research, USA

*Beneficiation of Phosphates III*
  December 2-7, 2001
  St. Petersburg, Florida
  Conference Chairs:
  Patrick Zhang, Florida Institute of Phosphate Research, USA
  P. Somasundaran, Columbia University, USA
  Hassan El-Shall, Florida Institute Phosphate Research, USA
  R. Stana, R. Squared S., Inc., USA

*Beneficiation of Phosphates IV*
  December 5-10, 2004
  Miami Beach, Florida
  Conference Chairs:
  Patrick Zhang, Florida Institute of Phosphate Research, USA
  Hassan El-Shall, Florida Institute Phosphate Research, USA
  Jan Miller, University of Utah
  R. Stana, R. Squared S., Inc., USA

*Beneficiation of Phosphates V*
  February 17-22, 2008
  Rio de Janeiro, Brazil
  Conference Chairs:
  Patrick Zhang, Florida Institute of Phosphate Research, USA
  Hassan El-Shall, Florida Institute Phosphate Research, USA
  Laurindo Leal Filho, University of Sao Paulo, Brazil
  Karen Swager, Mosaic Fertilizer LLC, USA

*Beneficiation of Phosphates VI*
  March 6-11, 2011
  Kunming, China
  Conference Chair:
  Patrick Zhang, Florida Institute of Phosphate Research, USA
Conference Sponsors

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Multotec Process Equipment

Scantech International Pty Ltd

Stefanutti Stock

Ultimate Flotation

Weir Minerals Africa
Sunday, April 29, 2018

16:30 – 18:00  Registration (Foyer of Conference Venue Hall A, Ground floor of conference center)
18:00 – 19:00  Welcome Reception - Wine Tasting (Business Lounge, 1st floor of conference center)
19:00 – 21:30  Dinner (Meeting Room 11, 1st floor of conference center)

NOTES

- Technical Sessions will be held in Conference Venue Hall A, on the ground floor of conference center.
- The ECI office will be the Organizer Office, ground floor of conference center.
- Breakfasts for those staying in the hotel will be in the hotel’s Square Cafe and Wine Bar.
- Dinners on Sunday, Monday and Thursday will be in Meeting Room 11, 1st floor of conference center.
- Dinner on Tuesday is “on your own.”
- Audio, still photo and video recording by any device (e.g., cameras, cell phones, laptops, PDAs, watches) is strictly prohibited during the technical sessions, unless the author and ECI have granted prior permission.
- Speakers – Please have your presentation loaded onto the conference computer prior to the session start (preferably the day before). Shengxi Wu will be assisting speakers in loading their presentations.
- Speakers – Please leave discussion time as previously directed by your session chair.
- Please do not smoke at any conference functions.
- Turn your mobile telephones to vibrate or off during technical sessions.
- Please write your name on your program so that it can be returned to you if lost or misplaced.
- After the conference, ECI will send an updated participant list to all participants. Please check your listing now and if it needs updating, you may correct it at any time by logging into your ECI account.
Monday, April 30, 2018

07:00 – 08:30  Breakfast
08:30 – 08:40  **Welcoming Remarks**  
**Conference Co-Chair, Marius Porteus, Foskor, South Africa**
08:40 – 08:50  **Opening Remarks**  
**Conference Chair, Patrick Zhang, Florida Industrial and Phosphate Research Institute, USA**
08:50 – 09:00  **ECI & Vital Conference Information**  
**Conference Organizer, Kevin Korpics, ECI, USA**

09:00 – 12:05  **Session I: Sustainability and the Environment**  
**Session Co-Chairs:** Marius Porteus, Foskor, South Africa  
Luca Moore, ArrMaz, USA

09:00 – 09:35  **Keynote 1**  
**Surface Chemistry and Flotation Behavior of Monazite, Apatite, Ilmenite, Quartz, Rutile, and Zircon with Octanohydroxamic Acid**  
Corby Anderson, Colorado School of Mines, USA

09:35 – 10:00  **Resource-Saving Technology for Processing By-Products of the Wet Phosphoric Acid Process – Phosphogypsum and Fluosilicic Acid to Produce Ammonium Sulfate**  
Maksim Tcikin, The Research Institute for Fertilizers, Russia

10:00 – 10:25  **Recovery of High Purity Calcium Sulfate from Phosphogypsum I: Thermodynamic Study of SO₄²⁻ Purification**  
Zeqiang Zhang, Wuhan Institute of Technology

10:00 – 10:25  **Recovery of High Purity Calcium Sulfate from Phosphogypsum I:**  
**Thermodynamic Study of SO₄²⁻ Purification**  
Zeqiang Zhang, Wuhan Institute of Technology

10:25 – 10:55  Coffee break

10:55 – 11:20  **Dry Beneficiation of Phosphate Minerals Using a Triboelectric Belt Separator**  
Kyle Flynn, ST Equipment & Technology, USA

11:20 – 11:45  **Removal of Coarse Fraction from Phosphatic Clays for Clay Settling Area Reduction and Additional Phosphate**  
Charles Guan, Mosaic Fertilizer, LLC, Florida, USA

11:45 – 12:05  **Upgrading Phosphogypsum for Uses as Construction Materials**  
Wending Xiao, Wuhan Institute of Technology, China

12:15 – 14:00  Lunch
Monday, April 30, 2018 (continued)

14:30 – 17:40  
**Session II: Comprehensive Extraction**

**Session Co-Chairs:** Neil Snyders, Stellenbosch University, South Africa  
Barend du Plessis, University of Pretoria, South Africa

14:30 – 15:05  
**Keynote 2:**  
**Rare Earths Occurrence in Florida Phosphate Ore and Their Fate during Mining and Chemical Processing**  
Patrick Zhang, Florida Industrial and Phosphate Research Institute, USA

15:05 – 15:30  
**The Recovery of Rare Earth Elements from Phosphate Rock and Phosphate Mining Waste Products Using A Novel Water-Insoluble Adsorption Polymer**  
Joseph Laurino, Periodic Products, Inc., Florida, USA

15:30 – 15:55  
**A Novel Process to Recover Sulfur, Lime and Rare Earths from Gypsum**  
David van Vuuren, University of Pretoria, South Africa

15:55 – 16:25  
Coffee break

16:25 – 16:50  
**Hydrothermal Pre-Treatment Process of Phosphogypsum for Enhanced Rare Earths Recovery**  
Volha Yahorava, Mintek, South Africa

16:50 – 17:15  
**Simultaneous Recovery of Rare Earths and Uranium from Wet Process Phosphoric Acid Using Solvent Extraction with D2EHP**  
Shengxi Wu, National Engineering Research Center for Rare Earth Materials, General Research Institute for Nonferrous Metals, Beijing, China

17:15 – 17:40  
**Recovery of Thorium from Phosphogypsum by Acid Leaching**  
Tebogo Mashifana, University of Johannesburg, South Africa

19:00 – 20:30  
Dinner

20:30 – 21:30  
Social Hour (Business Lounge, 1st floor of conference center)
**Tuesday, May 1, 2018**

07:00 – 08:30  Breakfast

08:30 – 12:20  **Session III: Flotation Fundamentals and Reagents**  
**Session Co-Chairs:** Charles Guan, The Mosaic Company, USA  
André Silva, Federal University of Goiás, Brazil

08:30 – 09:05  **Keynote 3**  
*History and Future of Phosphate Mining and Beneficiation in South Africa*  
Marius Porteus, Foskor, South Africa

09:05 – 09:30  **How to Truly Optimize Phosphate Flotation, When Feed Grade is Ever-changing**  
Lucas R. Moore, ArrMaz, USA

09:30 – 09:55  **New Reagent Development for the Beneficiation of Various Phosphate Ores**  
Pablo Dopico, Clariant Mining Solutions, USA

09:55 – 10:20  **Mine Arnaud Project: Flotation Circuit Adjustment and Collector Reduction**  
Christine Croteau, COREM, Canada

10:20 – 10:40  Coffee break

10:40 – 11:05  **Case Study for Processing Phosphate Ores Worldwide**  
Guoxin Wang, ArrMaz, USA

11:05 – 11:30  **Evaluation of the Effect of Ca²⁺ Ion Concentration on Calcite Flotation of Santa Quitéria’s Ore Using Carbonic Gas**  
Amanda Soares, Centro de Tecnologia Mineral (CETEM), Brazil

11:30 – 11:55  **Investigation of the Mechanism of Apatite/Carbonates Separation in Acidic Flotation Process Using In Situ Raman Spectroscopy**  
Lev Filippov, Université de Lorraine, France

Mohammed El Asri, Sidi Mohamed Ben Abdellah University, Morocco

12:30 – 14:00  Lunch

14:00  Free time/Optional self-organized excursion(s)

Dinner on your own
**Wednesday, May 2, 2018**

07:00 – 08:30  Breakfast

**Session IV: Flotation Fundamentals and Reagents Part 2**

08:30 – 12:00  Session Co-Chairs: Pablo Dopico, Clariant Mining Solutions, USA
Volha Yahorava, Mintek, South Africa

08:30 – 09:00  **Tailoring Collectors to Allow for Sea Water Usage in Phosphate Beneficiation**
Lucas R. Moore, ArrMaz, USA

09:00 – 09:30  **The Surface Chemistry and Microflotation of Xenotime and Depression of Gangue Minerals**
Corby Anderson, Colorado School of Mines, USA

09:30 – 10:00  **Heavy Metal Contamination and Health Risk Assessment in Waste Mine Water Dewatering Using Phosphate (oral132s1) Beneficication Processes**
Mohammad Salem Al-Hwaiti, Al-Hussein Bin Talal University, Jordan

10:00 – 10:30  Coffee break

10:30 – 11:00  **Alternative Depressor for Apatite Flotation**
André Carlos Silva, Federal University of Goiás, Brazil

11:00 – 11:30  **Separation of Dolomite from Phosphate at Low Cost and Reduced Environmental Impact**
Wending Xiao, Hubei Bonan Technology Co., Ltd, China

11:30 – 12:00  **Using Two Alternative Vegetable Oil’s as Collector in Apatite Froth Flotation**
André Carlos Silva, Federal University of Goiás, Brazil

12:30 – 14:00  Lunch

14:00 – 19:00  Group Tour (City tour of Cape Town and trip up Table Mountain) followed by transfer to Gold Restaurant

19:00 – 21:00  Off site dinner at Gold Restaurant (with transfer back to hotel)
Thursday, May 3, 2018

07:00 – 08:30  Breakfast

08:30 – 11:40  Session V: Hydrometallurgy
  Session Co-Chairs: Christine Croteau, COREM, Canada
                   Guven Akdogan, Stellenbosch University

08:30 – 09:05  Keynote 4
  Latest Trend for Fluorine in the Phosphoric Industry: Absorption Efficiency
  Improvement, Conversion into Raw Material
  Tibaut Theys, Prayon Technologies, Belgium

09:05 – 09:30  Can Your P₂O₅ Be Commercially Exploited?
  Ewan Wingate, WorleyParsons, Australia

09:30 – 09:55  How Phosphate Rock Quality Impacts the Phosphoric Acid and Granulation Plant
  Operations
  Curtis Griffin, PegasusTSI, USA

09:55 – 10:20  Recovery of Rare Earths and P from Pre-concentrated Phosphate Flotation Tails by
  Sulfuric Acid Leaching
  Patrick Zhang, FIPR Institute, USA

10:20 – 10:50  Coffee break

10:50 – 11:15  Revisiting the Merseburg Process: Economic Opportunity and Environmental
  Benefit?
  Gary Albarelli, Florida Industrial and Phosphate Research Institute, USA

11:15 – 11:40  Recovery of Rare Earth Elements from Phosphate Rock by Hydrometallurgical
  Processes - A Critical Review
  Shengxi Wu, National Engineering Research Center for Rare Earth Materials, General
  Research Institute for Nonferrous Metals, Beijing, China

12:00 – 13:30  Lunch
### Session VI: Advances in Processing Technology and Equipment

**Session Co-Chairs:** Dan Darlington, JR Simplot Co., USA  
Johan Van Niekerk, Ultimate Flotation, South Africa

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<td>Physical Separation of High Grade and Low Grade African Phosphates</td>
<td>Deepika Babu Dayal</td>
<td>Mintek, South Africa</td>
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<td>14:25 – 14:50</td>
<td>Evaluation of an Aguia Resources-Três Estradas Brazilian Phosphate Ore Using Column Flotation</td>
<td>Khosana Mohlabane</td>
<td>Eriez Flotation Division - SA, South Africa</td>
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<td>14:50 – 15:15</td>
<td>Influence of the Impeller Speed on Phosphate Rock Flotation</td>
<td>André Carlos Silva</td>
<td>Federal University of Goiás, Brazil</td>
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<td>15:40 – 16:00</td>
<td>Coffee break</td>
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<td>16:00 – 16:25</td>
<td>A Comparative Study of Different Columns Sizes for Ultrafine Apatite Flotation</td>
<td>Elves Matiolo</td>
<td>Centro de Tecnologia Mineral, Brazil</td>
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<td>16:25 – 16:50</td>
<td>The Fundamentals, Unique Features and Performance of A Newly Improved Packed Column Jig for Phosphate Processing</td>
<td>Wending Xiao</td>
<td>Wuhan Institute of Technology, China</td>
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<td>16:50 – 17:15</td>
<td>Milling of the Phosphate Rock Flotation Circuit Circulating Load Aiming Production Increase and Iron Content Reduction in the Final Concentrate</td>
<td>André Carlos Silva</td>
<td>Federal University of Goiás, Brazil</td>
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<td>19:00 – 21:00</td>
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Friday, May 4, 2018

07:00 – 08:30
Breakfast
Departures

For the Technical Excursion group: Trip to Phalaborwa and tour of Foskor phosphate mine
Poster Presentations

1. The Ultimate Phosphate Flotation solution
   Johan Swanepoel, Ultimate Flotation, South Africa

2. New approach to phosphate ore beneficiation coupling chemistry and hydrodynamic of flotation process
   Inna V. Filippova, University of Lorraine, France

3. Best practices of Russia in extracting ree from fertilizer waste
   Sergey Kirillov, Ural Federal University, Russia

4. Benefication of Estonian phosphate ore by flotation
   Kadriann Tamm, Tallinn University of Technology, Estonia