

*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**

**Mr. Marius Porteus  
Foskor, South Africa**

**Dr. Neil Snyders  
Stellenbosch Univ., South Africa**

**Mr. Ewan Wingate  
WorleyParsons, Australia**

**Professor Guven Akdogan  
Stellenbosch Univ., South Africa**



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Xiang Yang, China Univ. Geosciences  
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**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

***Beneficiation of Phosphates VII***

**March 29-April 3, 2015**

**Melbourne, Australia**

*Conference Chairs:*

Patrick Zhang Florida Institute of Phosphate Research, USA

Jan Miller, University of Utah, USA

Julian Hilton, Aleff Group, United Kingdom

Laurindo Leal Filho, University of Sao Paulo/Vale, Brazil

Abdelaâli Kossir, OCP Group, Morocco

Ewan Wingate, WorleyParsons Services Pty Ltd, Australia

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## **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, 1 <sup>st</sup> floor of conference center)
19:00 – 21:30	Dinner (Meeting Room 11, 1 <sup>st</sup> 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, 1<sup>st</sup> 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 Tcikn, The Research Institute for Fertilizers, Russia
- 10:00 – 10:25 **Recovery of High Purity Calcium Sulfate from Phosphogypsum I: Thermodynamic Study of SO<sub>4</sub><sup>2-</sup> 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 Thourium 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, 1<sup>st</sup> 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 Ca<sup>2+</sup> Ion Concentration on Calcite Flotation of Santa Quitérias'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
- 11:55 – 12:20 **Formulation of a Reagent Used in a Process of Water Recovery the Sludge from Beneficiation Process of Phosphate Ore Using Mixture Design**  
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
- 08:30 – 12:00 **Session IV: Flotation Fundamentals and Reagents Part 2**  
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) Beneficiation 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 P<sub>2</sub>O<sub>5</sub> 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

**Thursday, May 3, 2018 (continued)**

- 14:00 – 17:15      ***Session VI: Advances in Processing Technology and Equipment***  
**Session Co-Chairs:** Dan Darlington, JR Simplot Co., USA  
Johan Van Niekerk, Ultimate Flotation, South Africa
- 14:00 – 14:25      **Physical Separation of High Grade and Low Grade African Phosphates**  
Deepika Babu Dayal, Mintek, South Africa
- 14:25 – 14:50      **Evaluation of an Aguia Resources-Três Estradas Brazilian Phosphate Ore Using Column Flotation**  
Khosana Mohlabane, Eriez Flotation Division - SA, South Africa
- 14:50 – 15:15      **Influence of the Impeller Speed on Phosphate Rock Flotation**  
André Carlos Silva, Federal University of Goiás, Brazil
- 15:15 – 15:40      **Successful Applications of Vertical-Roller-Mills in Phosphate Processing**  
Jonathan Smith, Loesche South Africa, South Africa
- 15:40 – 16:00      Coffee break
- 16:00 – 16:25      **A Comparative Study of Different Columns Sizes for Ultrafine Apatite Flotation**  
Elves Matiolo, Centro de Tecnologia Mineral, Brazil
- 16:25 – 16:50      **The Fundamentals, Unique Features and Performance of A Newly Improved Packed Column Jig for Phosphate Processing**  
Wending Xiao, Wuhan Institute of Technology, China
- 16:50 – 17:15      **Milling of the Phosphate Rock Flotation Circuit Circulating Load Aiming Production Increase and Iron Content Reduction in the Final Concentrate**  
André Carlos Silva, Federal University of Goiás, Brazil
- 17:15 – 17:40      **GEOSCAN-M use at Ma'aden Phosphate Al Jalamid mine, Saudi Arabia**  
Luke Balzan, Scantech International, Australia
- 19:00 – 21:00      Banquet

**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 flotataion**  
Kadriann Tamm, Tallinn University of Technology, Estonia