Technical Program

Beneficiation of Phosphates IX
An ECI Conference Series
June 5 – 10, 2022
Helsinki, Finland

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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

Ms. Erika Rova
Yara International, Finland

Professor Andre Carlos Silva,
Federal University of Goiás, Brazil

Mr. Ewan Wingate
Bechtel Australia, Australia

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Xiang Yang, China University of Geosciences, China
Zeqiang Zhang, Wuhan Institute of Technology, China
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

Beneficiation of Phosphates VIII
April 29 – May 4, 2018
Cape Town, South Africa
Conference Chairs:
Patrick Zhang Florida Institute of Phosphate Research, USA
Jan Miller, University of Utah, USA
Laurindo Leal Filho, University of Sao Paulo/Vale, Brazil
Ewan Wingate, WorleyParsons, Australia
Neil Snyders, Stellenbosch Univ., South Africa
Professor Guven Akdogan, Stellenbosch Univ., South Africa
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Sunday, June 5, 2022

17:00 – 18:00  Registration (Merisali foyer in the hotel’s Conference and Events Center)
18:00 – 19:00  Welcome Reception (Merisali I)
19:00 – 21:30  Dinner (Merisali I)

Locations and Notes

- Technical sessions are in Siirtomaasali I in the hotel’s Conference and Events Center.
- Breakfast is available from 6:30 – 10:00 am in the Oceana Restaurant in the hotel.
- Lunches are in Merisali I in the hotel’s Conference and Events Center.
- The reception and dinner on Sunday are in Merisali I in the hotel’s Conference and Events Center.
- Dinners on Monday and Thursday are in Siirtomaasali II in the hotel’s Conference and Events Center.
- The ECI on site office is the Kapteeni Room.
- Please wear your mask except when giving a presentation or actively eating or drinking. Please maintain physical distancing as much as possible.
- Audio, still photo and video recording by any device (e.g., cameras, cell phones, laptops, etc.) 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).
- Speakers – Please leave at least 3-5 minutes for questions and discussion.
- Please do not smoke at any conference functions.
- Turn your mobile telephones to vibrate or off during technical sessions.
- 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.
- Emergency Contact Information: Because of privacy concerns, ECI does not collect or maintain emergency contact information for conference participants. If you would like to have this information available in case of emergency, please use the reverse side of your name badge.
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<th>Time</th>
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<tr>
<td>06:30 – 08:30</td>
<td>Breakfast</td>
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</table>
| 08:30 – 08:40 | **Welcoming Remarks**  
Conference Co-Chair, Erika Rova, Yara International, Finland |
| 08:40 – 08:50 | **Opening Remarks**  
Conference Chair, Patrick Zhang, FIPR Institute, Florida Polytechnic University, USA |
| 08:50 – 09:00 | **ECI & Vital Conference Information**  
Kevin Korpics, ECI, USA |
| 09:00 – 12:00 | **Session I: Recovery of Critical Elements**  
Session Co-chairs: James Mennie and Elves Matiolo |
| 09:00 – 09:25 | Challenges and Limitations of Processing Carbonatite Rare Earths Deposits in Brazil  
Elves Matiolo, Centro de Tecnologia Mineral, Brazil |
| 09:25 – 09:50 | Continuous Recovery of Phosphoric Acid and Rare-Earths Containing Particles from Phosphoric Acid Sludge Using a Decanter Centrifuge  
Patrick Zhang, Oak Ridge National Lab, USA |
| 09:50 – 10:15 | Nanofiltration Membrane and Liquid Extraction for Rare Earth Separation from Phosphate Ore Waste of Djebel Onk Algeria  
Mourad Amara, University of Science and Technology Houari Boumediene, Algeria |
| 10:15 – 10:45 | Coffee Break |
| 10:45 – 11:00 | Recovery of Valuable Elements from Phosphate Water Processing by Dissolved Air Flotation Technique  
Mustapha Adjadi, AMENHYD SPA, Algeria |
| 11:00 – 11:40 | Flotation of apatite and REEs as co-products from a Vietnamese sedimentary phosphate ore rich in carbonate and finely intergrowth  
Huu Duong HOANG, Maelgwyn Mineral Services Ltd, Vietnam |
| 11:40 – 12:05 | Rare Earths in Phosphate: Occurrence, Significance and Opportunities for Recovery  
Patrick Zhang, FIPR Institute, Florida Polytechnic University, USA |
| 12:05 – 13:30 | Lunch |
| 14:00 – 17:40 | **Session II: Advances in Reagent Development**  
Session Co-Chairs: Gabriela Budemberg and Guoxin Wang |
| 14:00 – 14:25 | Atrac® 922 collector for phosphate flotation, jointly developed by Nouryon and Yara, yields high performance and reduces environmental impact  
Henrik Nordberg, Nouryon Surface Chemistry, Sweden |
| 14:25 – 14:50 | Characterization of fatty acid-based collectors vis-à-vis apatite flotation in basic medium  
Laurindo de Salles Leal Filho, Brazil |
| 14:50 – 15:15 | New reagent scheme for processing Florida phosphate ores  
Guoxin Wang, Arkema-ArrMaz, USA |
| 15:15 – 15:45 | Coffee break |
| 15:45 – 16:10 | Synergy of collectors for phosphate flotation in Serra do Salitre Complex  
Gabriela Budemberg, BASF, Brazil |
| 16:10 – 16:35 | Natural Alternative Source of Fatty Acids for Phosphate Rock Flotation  
André Carlos Silva, Federal University of Catalão, Brazil (Virtual) |
<table>
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| 16:35 – 17:00 | **Bioflotation of Apatite with Saccharomyces Cerevisiae in Hallimond Tube**  
  André Carlos Silva, Federal University of Catalão, Brazil *(Virtual)* |
| 17:00 – 17:25 | **Low Grade Igneous Phosphatic Rock Flotation Using Sorghum Starch as Depressor**  
  Elenice M. S. Silva, Federal University of Catalão, Brazil *(Virtual)* |
| 19:00 – 20:30 | Dinner                                                                 |
| 20:30 – 21:30 | Social Hour                                                            |
Tuesday, June 7, 2022

06:30 – 08:30  Breakfast

08:30 – 12:20  **Session III: Physical Separation and Process Analysis**
Session Co-Chairs: Sahla Al-thyabat and Ashma Singh

08:30 – 08:55  Beneficiation of medium and low grade African phosphates in the context of stimulating supply
Ashma Singh, Mintek, South Africa

08:55 – 09:20  The increasing usage of GEOSCEN online analysis in phosphate processing
Luke Balzan, Scantech International, Australia

09:20 – 09:45  Mineral liberation using selective fragmentation of phosphate ore
Lev Filippov, Université de Lorraine, France

09:45 – 10:10  The run of mine grade is on target but the process plant is underperforming – what’s the problem?
Ewan Wingate, Bechtel Australia, Australia

10:10 – 10:50  Coffee break

10:50 – 11:15  **Innovative Gravity Separation for Sustainable Utilization of Mineral Resources**
James Mennie, FIPR Institute, Florida Polytechnic University, USA

11:15 – 11:40  Beneficiation of phosphate ores using tribo-electrostatic separator
Abhishek Gupta, ST Equipment & Technology, USA

11:40 – 12:05  Flotation processing of Elandsfontein sedimentary phosphate ore from South Africa
Getrude Marape, Mintek, South Africa

12:05 – 13:30  Lunch

Afternoon  Free time

Dinner on your own
**Wednesday, June 8, 2022**

06:30 – 08:30 Breakfast

08:30 – 12:00 **Session IV: Hydrometallurgical Processing**
Session Co-Chairs: Sébastien Havelange and Laurin de Salles Leal Filho

08:30 – 09:00 **Phosphate Rock Beneficiation through Production of DCP “Super-Rock” as a Raw Material for Phosphoric Acid Plants**
Sébastien Havelange, Prayon Technologies, Belgium

08:30 – 09:00 **Phosphate Rock Beneficiation through Production of DCP “Super-Rock” as a Raw Material for Phosphoric Acid Plants**
Sébastien Havelange, Prayon Technologies, Belgium

09:00 – 09:30 **Foaming and Defoaming of the Wet Process Phosphoric Acid**
Guoxin Wang, Arkema-ArrMaz, USA

09:30 – 10:00 **New process to produce Di-calcium sulfate from low grade rock or tailing using diluted or by-product sulfuric acid**
Gauthier Humblet, Prayon Technologies, Belgium

10:00 – 10:30 Coffee break

10:30 – 11:00 **Brief Introduction of Ma’aden’s Phosphoric Acid Complexes**
Mohamed Belghiti Alaoui, Ma’aden Phosphate Company, Saudi Arabia

11:00 – 11:30 **Prospects of development smart collectors for phosphorite flotation: nanoparticles-based collectors**
Gary Albarelli, FIPR Institute, Florida Poly

11:30 – 12:00 **Analysis of Different Schemes for Recovery of REE from Phosphoric Acid**
Patrick Zhang, FIPR Institute, Florida Polytechnic University, USA

12:30 – 14:00 Lunch

15:00 – 20:30 **Conference Excursion with dinner included**

*Guided Tour of Helsinki until 17:15*

*At 17:30, board boat for cruise and tour with buffet dinner*

*Return to hotel approximately 20:30*

**At 15:00: Tour begins at the Hotel Hilton Kalastajatorppa**

A comprehensive tour taking in the most important and interesting parts of Helsinki, such as the Helsinki Cathedral at the Senate Square, the Presidential Palace, City Hall, the Parliament building, Finlandia Hall, the Opera House, the Helsinki Music Centre, and Central Library Oodi. Stop at the Sibelius Monument.

At about 17:15: Tour ends at the Market Square

**At 17:30: Private dinner cruise starts from the Market Square**

Tour presents the most beautiful shorelines in Helsinki and many fabulous sights, including the historic Suomenlinna Maritime Fortress, Helsinki Zoo on Korkeasaari Island, and Degerö Canal.
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<td>08:30 – 11:00</td>
<td><strong>Session V: Sustainability &amp; the Environment</strong>&lt;br&gt;Session Co-Chairs: Ewan Wingate and Henrik Nordberg</td>
</tr>
<tr>
<td>08:30 – 09:00</td>
<td><strong>Smart Road with Phosphogypsum as Road Base</strong>&lt;br&gt;Gary Albarelli, FIPR Institute, Florida Polytechnic University, USA</td>
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<td>09:00 – 09:30</td>
<td><strong>Contributions to a circular phosphate economy - Polyphosphate production in Saccharomyces cerevisiae</strong>&lt;br&gt;Jana Fees, Institute of Applied Microbiology, RWTH Aachen University, Germany</td>
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<td>09:30 – 10:00</td>
<td><strong>Review of MgO Removal Processes for Florida Rock</strong>&lt;br&gt;Charles Guan, The Mosaic Company, USA</td>
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<tr>
<td>10:00 – 10:30</td>
<td>Coffee break</td>
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<tr>
<td>10:30 – 11:00</td>
<td><strong>Apatite flotation from iron oxide apatite (IOA) tailings</strong>&lt;br&gt;Rickard Jolsterå, Luossavaara-Kirunavaara AB, Sweden</td>
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<tr>
<td>11:00 – 11:30</td>
<td><strong>Sustainability Programs of the Arab Fertilizer Association</strong> (to be confirmed)&lt;br&gt;Mahamed Ali, Arab Fertilizer Association, Egypt</td>
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<tr>
<td>11:30 – 12:00</td>
<td><strong>Rare earths recovery and gypsum upgrade from Florida phosphogypsum</strong>&lt;br&gt;Patrick Zhang, FIPR Institute, Florida Poly</td>
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<tr>
<td>12:00 – 13:30</td>
<td>Lunch</td>
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<tr>
<td>14:00 – 16:00</td>
<td><em>Ad hoc</em> discussion on REE recovery</td>
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<tr>
<td>16:00 – 16:30</td>
<td>Coffee Break</td>
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<tr>
<td>19:30 – 22:00</td>
<td>Conference Banquet and Social Hour</td>
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Friday, June 10, 2022

06:30 – 08:30  Breakfast

Departures

Optional Technical Excursion: Trip to Siilinjärvi and tour of Yara phosphate complex (costs not included in the registration fee)

Tentative Schedule:

14:00       Picking PPE's
14:30 - 15:30  Coffee + Introduction to Siilinjärvi site, short presentations
15:30 - 17:30  Tours