

Technical Program

Beneficiation of Phosphates IX

An ECI Conference Series

June 5 – 10, 2022

Helsinki, Finland

Chair

Dr. Patrick Zhang

**FIPR Industrial and Phosphate Research Institute
Florida Polytechnic University**

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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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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.*

Monday, June 6, 2022

- 06:30 – 08:30 Breakfast
- 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 – 11:10 **Recovery of Valuable Elements from Phosphate Water Processing by Dissolved Air Flotation Technique**
Mustapha Adjadi, AMENHYD SPA, Algeria
- 11:10 – 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*)

Monday, June 6, 2022 (continued)

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| 16:35 – 17:00 | Bioflotation of Apatite with <i>Saccharomyces Cerevisiae</i> in Hallimond Tube
André Carlos Silva, Federal University of Catalão, Brazil (<i>Virtual</i>) |
| 17:00 – 17:25 | Low Grade Igneous Phosphatic Rock Flotation Using Sorghum Starch as Depressor
Elenice M. S. Silva, Federal University of Catalão, Brazil (<i>Virtual</i>) |
| 19:00 – 20:30 | Dinner |
| 20:30 – 21:30 | Social Hour |

Tuesday, June 7, 2022

06:30 – 08:30	Breakfast
08:30 – 12:20	<u>Session III: Physical Separation and Process Analysis</u> 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 GEOSCAN online analysis in phosphate processing Luke Balzan, Scantech International, Australia
09:20 – 09:45	Mineral liberation using selective fragmentation of phosphate ore Lev Filippov, Universiyé 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
- 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.

Thursday, June 9, 2022

- 06:30 – 08:30 Breakfast
- 08:30 – 11:00 **Session V: Sustainability & the Environment**
Session Co-Chairs: Ewan Wingate and Henrik Nordberg
- 08:30 – 09:00 **Smart Road with Phosphogypsum as Road Base**
Gary Albarelli, FIPR Institute, Florida Polytechnic University, USA
- 09:00 – 09:30 **Contributions to a circular phosphate economy - Polyphosphate production in *Saccharomyces cerevisiae***
Jana Fees, Institute of Applied Microbiology, RWTH Aachen University, Germany
- 09:30 – 10:00 **Review of MgO Removal Processes for Florida Rock**
Charles Guan, The Mosaic Company, USA
- 10:00 – 10:30 Coffee break
- 10:30 – 11:00 **Apatite flotation from iron oxide apatite (IOA) tailings**
Rickard Jolsterå, Luossavaara-Kiirunavaara AB, Sweden
- 11:00 – 11:30 **Sustainability Programs of the Arab Fertilizer Association** (to be confirmed)
Mahamed Ali, Arab Fertilizer Association, Egypt
- 11:30 – 12:00 **Rare earths recovery and gypsum upgrade from Florida phosphogypsum**
Patrick Zhang, FIPR Institute, Florida Poly
- 12:00 – 13:30 Lunch
- 14:00 – 16:00 *Ad hoc* discussion on REE recovery
- 16:00 – 16:30 Coffee Break
- 19:30 – 22:00 Conference Banquet and Social Hour

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