MIT Industrial Liaison Program Faculty Knowledgebase Report

Mining Technologies, Part 2: Dry Processes

December 2, 2020 2:00 pm - 3:00 pm

2:00pm - 2:50pm

Enhanced Selectivity for Sustainable Materials Processing
Antoine Allanore
Associate Professor of Metallurgy, MIT Department of Materials Science and Engineering
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Prof. Antoine Allanore has more than a decade of experience in the field of chemical metallurgy. Since 2004, as R&D engineer at ArcelorMittal in France, then at MIT since 2010, he has developed several alternative processes for metal extraction that adopt green chemistry principles. He co-founded Boston Electrometallurgical Corporation (BEMC) to engineer the large-scale development of such approaches. In 2012, he was appointed the T.B. King Assistant Professor of Metallurgy in the Department of Materials Science & Engineering at MIT, where his research group aims at developing sustainable materials extraction and manufacturing processes. His group has proposed a novel approach to investigate and control water/mineral interactions in soils using microfluidics (Word Congress on Soils Science, Korea, 2014, PLOSOne, 2015). Focusing on mining and processing of unconventional resources (Journal of the Total Environment, 2015, Green Chemistry 2015), he invented a waste-free process to produce a potassium fertilizer from earth-abundant raw materials. The product has been designed to suit tropical soils and has succeeded crop-tests. It is now under field evaluation in Brazil (16th World Fertilizer Congress, Rio, 2014). He teaches thermodynamics and sustainable chemical metallurgy at both the undergraduate and graduate level. He was awarded the DeNora Prize in 2012 and the Early Career Faculty Fellow award in 2015, both from TMS (The Minerals, Metals & Materials Society).

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Our research supports the necessary transformation of the materials extraction and recycling processes in order to mitigate their environmental impact and accommodate a global market dominated by China. We develop processes that target higher productivity, lower GHG emissions and limited water and chemical consumptions. The developments reported herein are applicable to primary extraction, anchored in the reality of mining challenges such as liberation size or low ore grades (for example nickel or copper). Our findings extend to recycling and downstream recovery, in particular for products containing rare-earths, precious metals or even cobalt. Our processes enable to upgrade, with minimal cost and environmental impact, mixed solid compounds such as crushed ores, slags, tailings or recycled streams. We efficiently transform such feeds into new solid phases that are amenable to cost effective and well established recovery with physical separations technologies. Furthermore, we have demonstrated the unique ability to use those stream to recover metallic products with more cost efficient technologies that are integrated with the deployment of green electrical power.

2:50pm - 3:20pm Startups Lightning Talks

- Boston Metal: Efficient, emissions-free steel production
- Lelantos: Semiconductor gas sensors for industrial threat detection

Stylianos Siontas
Co-Founder, Lelantos

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Co-Founder
Lelantos

PhD in Electrical Engineering at Brown University focused on semiconductor devices for sensing and energy generation. Currently at Columbia University working to commercialize gas sensing technology at Lelantos.

Adam Rauwerdink
VP, Business Development
Boston Metal