SEMINAR SERIES

The Department of Geosciences

Monday, Jan. 22, 2018
4 to 5 p.m. in 1118 Rood Hall

Engineered microbial platforms for phosphorus sustainability: ensuring food security and clean water for future generations

Phosphorus (P) is critical for sustaining food security for the growing world population. However, nearly half of total mined P from non-renewable phosphate rock is lost through nonpoint particulate runoff annually, causing eutrophication and harmful algal blooms in surface water resources. Global reserves of phosphate rock ores are currently being depleted and concentrated in limited geopolitical regions in the world. Recovering P losses in the environment is considered a significant step toward closing the loop in the disjointed global P cycle for nutrient and water sustainability in order to meet the food and water needs of future generations.

My long-term research goal is to understand and adapt biogeochemical P cycling processes mediated by P-solubilizing fungi (PSF) to reclaim substantial P losses in particulate runoff for sustainable recycling and reuse. In this presentation, I will discuss recent findings stemming from efforts by my research group aimed at exploring the fundamental aspects related to P bioavailability, P speciation dynamics, biogeochemical reaction kinetics, and process conditions that govern P extractability from nonpoint runoff particulate matter. These previously unexplored substrates for P extraction consist mainly of multicomponent inorganic (i.e., minerals) and organic P-binding pools. Metabolites (e.g. organic acids) and enzymes (e.g. phosphatases) can be generated and employed by fungi to mine elemental and nutrient resources from the environment to support their own growth and metabolism. These fungal capabilities can be harnessed to mobilize bound P from intercepted particulate runoff and recovered using precipitation or adsorption downstream processes. The knowledge gained about the interactions between these P-binding and fungal P-mobilizing systems is crucial to developing scalable and field-deployable engineered systems aimed at recovering nonpoint P losses attributed to particulate runoff in eutrophic watersheds throughout the globe.

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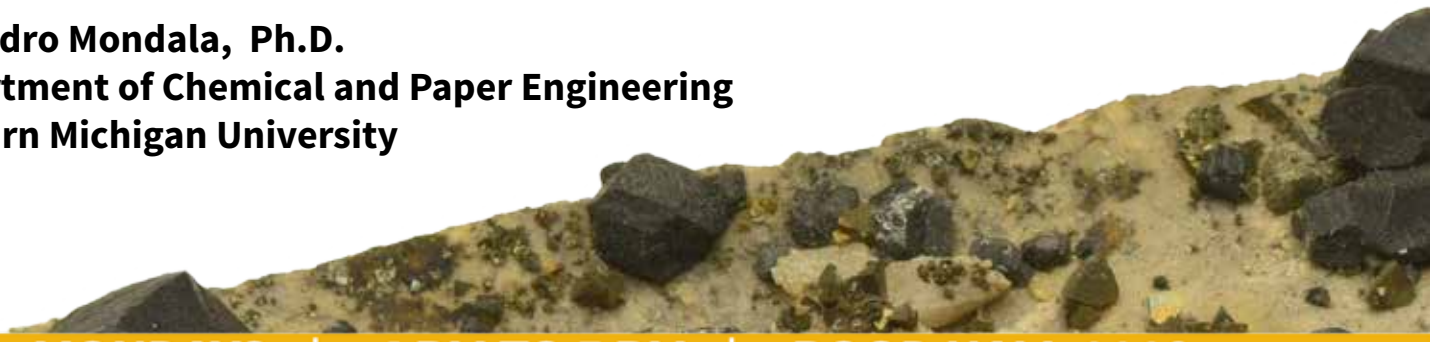

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