

**Environmental Engineering**

**and Earth Sciences**

**EEES Department Seminar**

**“environmental implications of landfill leachate organic matter”**

**PRESENTED BY**

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**Abstract**: The majority of the municipal solid waste generated in the United States is landfilled and this practice is expected to continue well into the future. Landfill leachate is generated both from water percolating through the waste and from the in-situ processes that occur within the landfill. Organic matter present in the generated leachate remains high (up to 4.5 g/L) for many decades. Leachate organic matter (LOM) is problematic because it is highly colored and is known to transport heavy metals and hydrophobic organic contaminants. Leachate is frequently co-treated at a wastewater treatment plant (WWTP) where it may be problematic. For example, untreated LOM may lead to disinfection byproducts and the recalcitrant nitrogen associated with LOM may pose challenges if discharged to nutrient limited water bodies. This presentation will highlight research that focuses on the environmental implications of LOM including LOM-nanoparticle (NP) interactions and long-term landfill management.

The behavior of metallic NPs in a landfill was evaluated by examining the interactions between NPs and leachate components. NP characterization, leachate size fractionation, five-day biochemical oxygen demand and biochemical methane potential tests, and chemical speciation modeling provided insight into the mobility of NPs in landfill leachate and their effects on landfill biological processes. Increased aqueous phase concentrations supported the dispersibility and dissolution of the added NPs primarily due to interaction with LOM, stabilizing the NPs in the aqueous solution. The majority of the aqueous NPs aggregated and were present as larger particles which might be retained in the solid waste as the leachate moves through the landfill.

The release of LOM from a landfill is greatly influenced by the extent of stabilization of the solid waste. Therefore to reduce the long-term pollution potential three landfill completion approaches were evaluated for their effectiveness in removing releasable carbon and nitrogen. The landfill completion approaches include flushing with clean water, leachate recirculation and ex-situ treatment, and leachate recirculation, ex-situ treatment, and in-situ aeration. Extensive treatment of the waste in the flushing bioreactors successfully achieved significant pollution reduction.

This research has provided valuable insight on the behavior of LOM and the technological requirements to stabilize a landfill. Future research will examine, in more detail, the chemical nature of LOM to better understand the humification of landfilled waste and the fate of discharged LOM to the environment after in situ landfill treatment, co-treatment at a WWTP, and on-site biological treatment.

**Bio**: Stephanie C. Bolyard is a Ph.D. candidate at the University of Central Florida and an Environmental Research and Education Foundation Doctoral Scholar. She received her M.S. in Environmental Engineering with a specialization in solid waste management at the University of Central Florida and B.S. in Chemistry from the University of Florida. Her research focuses on sustainable solid waste management, behavior of engineered nanoparticles in landfill leachate, and the generation, characterization, and environmental fate of leachate organic matter.

**3:30 PM**

Thursday, February 11, 2016

Rich Lab Auditorium Advanced Material Center

***Refreshments following Seminar***