CASE SCHOOL OF ENGINEERING
CASE WESTERN RESERVE UNIVERSITY

Department of Civil and Environmental Engineering

Case Western Reserve University
Bingham Bldg. Room 208
10900 Euclid Ave
Cleveland, OH 44106

Department of Civil and Environmental Engineering Seminar

Absorptive and Electrochemical CO_2 Separation Processes

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Friday January 31, 2020, 12:45-1:45PM @ Bingham 304
Lunch and discussion starting at 12:00PM at Bingham 102 (Vose Room)

Abstract
Among the grand challenges that engineers face today is the global climate change. Lessons learned from the industrialization era; 21st century engineers seek alternative approaches and processes that are environmentally benign. To mitigate global climate change and reduce carbon emissions from major contributors, discovery of novel materials and processes are essential for the foreseeable future. This talk will present the design approach and utility of ionic liquids (ILs) for capturing and utilizing CO_2 in various applications such as post-combustion. In addition, adaptation of IL-based materials for space applications to remove metabolically generated CO_2 from air will be discussed.

ILs as salts that are in liquid state below 100 ˚C and some below room temperature. They have wide liquidus range and present negligible vapor pressures with high thermal stability. Therefore, ILs are recognized as 'green solvents'. ILs' high CO_2 solubility and selectivity have attracted interest for separations from post and pre-combustion gases. Their affinity to CO_2 can be tuned by the choice of anion-cation pair and appending functional groups; thus enabling energy savings in separations. Dual utility of ILs as absorbing solvents and electrolytes, owing to their ionic conductivity, further enables the electrochemical separations and conversion of CO_2 to other commodities. We have designed ILs specifically for absorptive and electrochemical processes that are energy efficient compared to amine based solvents – the most mature technology in CO_2 capture. Currently, we are adapting these materials and design principles for the air revitalization needs to remove metabolically generated CO_2 in spacecraft and at the international space station. This presentation will provide performance comparison of our novel encapsulated ILs to the state-of-the-art zeolite absorbers for processes that need to operate under microgravity.

About the Speaker
Dr. Gurkan received a B.S. degree in Chemical Engineering from *Middle East Technical University*, (2004), M.S. degree from *University of Toledo* (2006) and PhD from *University of Notre Dame du Lac* (2011). She was a postdoctoral researcher at the *Massachusetts Institute of Technology* and the *University of Akron* before joining *Case Western Reserve University* (CWRU) as an assistant professor in 2016. Her current research interests include CO_2 capture & conversion, fundamentals of electrochemical processes in ionic liquids and deep eutectic solvents in particular for energy storage. Dr. Gurkan received the Best Master Thesis Award from the University of Toledo and was awarded Bayer Pre-doctoral Fellowship at the University of Notre Dame. She recently received the NASA Early Career Faculty and the American Chemical Society's Petroleum Research Fund - Doctoral New Investigator awards. She is the Thrust Leader and the Scientific Integration Officer for the DOE Energy Frontier Research Center: Breakthrough Electrolytes for Energy Storage (BEES) led by CWRU. She enjoys hiking, painting and spending time with her two daughters.