Stony Brook University

# Department of Civil Engineering

College of Engineering and Applied Sciences

## FALL 2022 SEMINAR SERIES


## Dr. Qingyun Li, Ph.D.

Assistant Professor, Department of Geosciences,
Stony Brook University


**Friday, December 2nd, 1:00 – 1:55 PM**
**Frey Hall Room 201**

## CO2 mineralization in wellbore cement and nitrogen removing biofilters


### Abstract

The practice of carbon capture, utilization, and storage (CCUS) has gained rapidly increasing attention as a way to reduce CO2 emission. In geologic CO2 sequestration, CO2 is injected through a wellbore to a targeted geologic formation for large scale, long-term storage. These CO2 can trigger mineral dissolution and precipitation of CaCO3 in wellbore cement, changing the cement pore structure and mechanical properties. While CaCO3 formation in cement matrix is usually believed to strengthen the cement, our results show that the overall cement strength was weakened due to formation of large dissolution zones. Modeling reveals that these weak zones are caused by microscale geochemical mechanisms. Despite the high efficiency of CO2 mineralization in cement, it is infeasible to produce cement solely for CO2 mineralization because of the large CO2 emission during cement production. Nevertheless, cement waste which otherwise will be disposed of in a landfill serves as a good candidate for reducing CO2 emission in engineered systems, such as a nitrogen removing biofilter. CO2 generated by denitrifying bacteria can form CaCO3 in cement, through which multiple contaminants can potentially be sequestered simultaneously.


## Speaker Biography

Qingyun Li is an assistant professor in geochemistry in the Department of Geosciences at Stony Brook University. She holds a bachelor's degree in environmental sciences from Peking University and completed her PhD in Energy, Environmental and Chemical Engineering at Washington University in St. Louis. Prior to joining Stony Brook University in the fall of 2021, she worked as a postdoc at Stanford University and SLAC National Accelerator Laboratory. She has extensive experience in using experimental approaches, geochemical modeling, and synchrotron X-ray techniques to study mineral reactions in porous media in during geologic CO2 sequestration and hydraulic fracturing. At Stony Brook, she is expanding her research to include underground hydrogen storage and environmental remediation.