

## Center of Excellence in Applied Computational Science and Engineering presents

### “Understanding the Rules of Life of Extreme Biofilms on Nano-Meter Coatings: Energy and Environmental Applications”

given by **Dr. Venkata Gadhamshetty**

Associate Professor, Civil and Environmental Engineering,  
South Dakota School of Mines & Technology  
March 1<sup>st</sup>, 11 a.m., UTC SimCenter Auditorium\*

*Public Invited*



Biofilms are incredibly beneficial and exceedingly harmful in many engineered and natural systems, including globally diverse domains of agricultural, industrial, and human systems. Biofilm development, whether desirable or not, is controlled by gene expression and genetic responses to environmental conditions. Physiological parameters including the local properties of surfaces govern the ability of “surface-adhering” and “surface-adapting” biofilms to develop phenotypically-heterogeneous biofilm environments that are unattainable by the individual microorganism. Dr. Gadhamshetty’s team aims to unravel the impact of nano-scale heterogeneity of surface properties on biofilms grown on metals modified with two dimensional (2D) coatings. Dr. Gadhamshetty’s lecture will discuss that a single layered coating of hexagonal boron nitride (SL-hBN-Cu) corrodes 2.5 times slower and reduces the double layer capacitance and pore capacitance of the underlying Cu surface by 4.5 fold and 10 fold better than graphene coatings. His lecture will also discuss the use of unique environments of the Sanford Underground Research

Laboratory and Yellowstone National Park to understand intricate interactions between biofilms and the surfaces they inhabit. These interactions form the basis for National Science Foundation’s Building Genome-to-Phenome Infrastructure for Regulating Methane in Deep and Extreme Environments. (BuG ReMeDEE) project in South Dakota. The lecture will also briefly discuss the ongoing studies on novel *Geobacillus* sp., biofilms for driving NASA microbial fuel cells.

Dr. Gadhamshetty is an established researcher in microbial electrochemistry and environmental engineering. His team is Dr. Venkata Gadhamshetty is an established researcher in microbial electrochemistry and environmental engineering. He has versatile research and teaching experiences from multiple institutions, including Rensselaer Polytechnic Institute, Florida Gulf Coast University, Air Force Research Laboratory, and Dupont. He is currently a Board Certified Environmental Engineer, a professional Engineer from the state of New York, Associate Professor at the South Dakota School of Mines and Technology (SD Mines), and water pollution engineering committee chair of Environmental and Water Resource Institute (EWRI) at ASCE. Dr. Gadhamshetty’s team is currently interrogating research questions at the interface of surface engineering, 2D materials, electrochemistry, system biology, and big data tools, with a primary goal of understanding rules of life of biofilms that grow on technologically relevant materials (conducting electrodes and metals) modified with nano-meter coatings. His research currently uses unique environments of the Sanford Underground Research Laboratory and Yellowstone National Park to understand intricate interactions between biofilms and the surfaces they inhabit in deep, extreme, and thermal environments, respectively.

Ongoing research projects (~\$8.0 million) are currently being funded by NSF, NASA EPSCoR, South Dakota Board of Regents, and Electric Power Research Institute. Among many awards, Dr. Gadhamshetty is a 2015 recipient of the National Science Foundation CAREER award and a 2016 recipient of the South Dakota School of Mines and Technology Research Award. His research on electricity production from defective tomatoes has been featured as a video by History Now and the American Chemical Society, as well as in press releases by BBC, CNN, History Now, and 350 other media outlets. He was also an invited speaker at the Rapid City Tedxtalk show in 2017.

