DEPARTMENT OF CHEMICAL & ENVIRONMENTAL ENGINEERING

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Polymeric Porous Materials and Polymerization within Porous Media: Design, Synthesis, and Applications

Polymes are versatile materials with attractive properties. They have been successfully used in various technologies ranging from optoelectronic to electrocatalytic, and separation. Development of effective approaches for polymer integration into current device architecture is of paramount importance for properly leveraging the attractive properties of polymeric materials in diverse contexts. Current emerging technologies that rely on polymeric materials as functional entities depend on the physical and chemical design of components at nanometer length scale. This translates to a need to develop effective methods to integrate polymeric materials with high accuracy at nanometer length scales. We use Initiated and Oxidative Chemical Vapor Deposition as solvent-free and green processing methods that enable polymerization and coating, with nanoscale accuracy, in one step. The aim is to understand the fundamentals of polymerization reactions within nanoscale confined structures, and to employ polymeric materials with precise and desirable chemical properties. Such coatings have a diverse range of applications in membrane processes, where problems associated with solvent processability have hindered technological development. The presentation starts by introducing practical approaches for designing polymeric templates using scalable and benign processing methods. The first part shows how the governing parameters can be tuned to achieve desirable structure and performance for the process under scrutiny. The second part of the presentation discusses the principles of the polymer CVD process and the potential that it offers for device fabrication. The presentation concludes with a discussion on promising future applications.

Biosketch: Dr. Siamak Nejati is currently a postdoctoral research associate in the Department of Chemical and Environmental Engineering at Yale University. Dr. Nejati's research at Yale is focused on materials development for membrane-based separation processes. In 2013, he earned his Ph.D. in Chemical Engineering from Drexel University under the supervision of Professor Kenneth K. S. Lau. During his doctoral studies, he developed new methods to integrate electrochemically active polymers into highly tortuous matrices. Dr. Nejati's research interest centers upon polymeric structures and coatings. Using these materials, he strives to develop economically viable and environmentally friendly processes, targeted at the current challenges facing our water and energy supplies.

FRIDAY, **MARCH 18, 2016**

9:30—10:30 AM

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