Northeastern University
College of Engineering

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Distinguished Seminar Speaker

Sustainability in the Chemicals Sector: From Green Synthesis to Global Systems

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Abstract: The chemicals sector is undergoing a transformation driven by decarbonization, shifting feedstocks, circularity, and increasing demand for low-carbon, non-toxic products. Globally, chemicals production is responsible for approximately 5% of worldwide greenhouse gas emissions, stemming from fuel combustion, process emissions, and product use. A wide variety of new technologies are being proposed to decarbonize chemicals manufacturing, but in many cases their environmental benefits are not obvious and they could even have the potential to degrade other aspects of environmental quality. Robust environmental assessment of energy use, resource inputs, and emissions over the entire chemicals life cycle is essential for to ensure that proposed green technologies will actually deliver promised environmental benefits.

To aid in this, life cycle assessment (LCA), techno-economic analysis (TEA), and related tools are increasingly being used in regulation, certification, and corporate decision-making. For example, US biofuels must meet a life cycle greenhouse gas emissions reduction target to be qualified as a renewable fuel, including emissions from production of chemical inputs that can drive overall results.

This seminar will present several LCA-based sustainability modeling projects in the chemicals industry, from single green syntheses to analysis of technology at the global systems scale. Case studies will include bio-based feedstocks, decarbonization efforts in pharmaceuticals and medicines, low-carbon fuels, and electrochemical synthesis techniques.

Biography: Matthew Eckelman is an Associate Professor of Civil and Environmental Engineering and affiliated faculty in Chemical Engineering at Northeastern, and adjunct Associate Professor at Yale School of Public Health. His research focuses on process simulation and life cycle assessment for industrial manufacturing, including primary metals, commodity and fine chemicals, pharmaceuticals, bio- and nano-materials. Dr. Eckelman worked previously for the Massachusetts executive office of environmental affairs and consults regularly on sustainability-related projects for industrial companies and non-profit institutions. He was awarded an NSF CAREER award in environmental sustainability in 2015 and is a member of the Lancet Countdown on Health and Climate Change. He holds a PhD in Chemical and Environmental Engineering from Yale, where he was affiliated with the Center for Industrial Ecology and the Center for Green Chemistry and Engineering.

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