

## 2019 NSE Grantees Conference

### Environmental and Economic Sustainability in Advanced Manufacturing of Nanomaterials

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**Abstract:** Nanomaterials can unlock previously inaccessible performance parameter spaces and are poised to overcome long-standing challenges in environment, climate, and society. However, some of the intended benefits of the technologies could be offset by negative environmental impacts without careful evaluation of the manufacturing processes. This talk will focus on approaches to enhance early assessment of environmental and technical performance to guide economically viable sustainable materials design, with emphasis on chemical environmental impacts and quantitative tools to enable simultaneous optimization strategies. While there are no one-size-fits-all design solutions, guiding principles and assessment tools will be presented. These include: the Principles of Green Engineering, life cycle considerations, and recent efforts to encourage the development of nanomaterials sustainability databases for co-optimization of environmental and functional performance metrics (e.g., such as Ashby materials selection diagrams). Finally, efforts to delineate sustainable synthesis chemistries using machine learning tools and necessary systematization to achieve those goals will be described. Put into practice, these tools seek to help ensure that nanomaterials achieve their noble goals of providing transformative, impactful technologies to advance the environment, technology, and society.

**Bio:** Desirée Plata's research seeks to maximize technology's benefit to society while minimizing environmental impacts in industrially important practices through the use of geochemical tools and chemical mechanistic insights. Plata earned her doctoral degree in Chemical Oceanography and Environmental Chemistry from the MIT/Woods Hole Oceanographic Institution's Joint Program in Oceanography and her bachelors degree in Chemistry from Union College in Schenectady, NY. Plata is an NSF CAREER Awardee, a National Academy of Engineers Frontiers of Engineering Fellow, a two-time National Academy of Sciences Kavli Frontiers of Science Fellow, and a Caltech Resnick Institute for Sustainability Fellow. Having previously served as Assistant

Professor of Civil and Environmental Engineering at Duke University, as the John J. Lee Assistant Professor of Chemical and Environmental Engineering and the Associate Director for Research at the Center for Green Chemistry and Green Engineering at Yale University, Plata is currently Gilbert W. Winslow Career Development Assistant Professor of Civil and Environmental Engineering at the Massachusetts Institute of Technology.