

2022 - 2023 Colloquium Series

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Nanomanufacturing with Low-Temperature Plasmas

Advanced manufacturing strategies have immense potential to reduce time and production costs for a range of applications. Meanwhile, the multiple functionalities and small size of nanomaterials can influence the versatility and capabilities of many devices including solar cells and solid-state lighting, energy conversion technologies and batteries, wearable electronics, and coatings. Combining advanced manufacturing with nanotechnology opens the door to exciting applications based on thin films and microstructures, with on-demand tunable functionality. One promising route to achieving advanced nanomanufacturing is to use low-temperature plasmas for synthesis of nanoparticles, together with advanced manufacturing methods which are compatible with roll-to-roll or additive printing methods. I will present my group's recent work on using low-temperature radiofrequency plasmas for synthesis of nanocrystals, and the merger of this synthesis technique with an additive manufacturing approach to deposition for tunable-property nanoparticle layers and patterns. The low-temperature synthesis of otherwise difficult-to-make semiconductor nanoparticles is uniquely paired with direct deposition onto arbitrarily chosen substrates – including temperature-sensitive materials such as polymers – for versatile deposition with on-demand property modulation. I will share our exploration of parameters such as ambient environment, pressure, radiofrequency power, and aerodynamic/electrostatic focusing for controlling the properties of the silicon nanoparticles and the layer deposition characteristics, as well as present ongoing research on other low-temperature plasma reactors for nanoparticle synthesis.

THURSDAY, NOVEMBER 17, 2022

WCH 205/206

11:00 AM - 12:00 PM



Rebecca is in rounding out her first decade as a faculty member at MSU, where her research projects are devoted to uncovering the physical and optoelectronic behavior of semiconductor nanomaterials based on the fundamental processes occurring in plasma reactors during synthesis, as well as revealing the parameters that govern nanoparticle interactions with their surroundings and each other. Rebecca was the recipient of the 2017 NSF CAREER award. She's very active in the Materials Research Society and is currently the Chair of the Broadening Participation in Materials Science and Engineering Coordination Group. Prior to joining MSU, she was at the University of Minnesota for her Ph.D. in Mechanical Engineering where she focused almost exclusively on the optical properties of silicon nanoparticles produced using a low-pressure plasma reactor. She got a B.A. from Carleton College in Northfield, MN, where she majored in Physics. She currently resides in Lansing with her husband Chris, a pediatrician and health informaticist, and two kids Lucia (almost 10) and Camille (almost 5). She enjoys running, swimming, going on hiking trips, baking sourdough bread, and making the occasional block print. Rebecca was a magic chicken for Halloween.