PURDUE UNIVERSITY

PURDUE MATERIALS ENGINEERING

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Materials Engineering
MSE 690
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Seminar Series

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3:30 pm
ARMS 1010

Design and Production of Microcapsules and Particles

Abstract: Microfluidics is being utilized for many applications ranging from life science research to lab-on-a-chip. Microfluidic technique has been developed over the past decades to produce uniform capsules and particles with low material consumption requirements, making it an ideal method for fast screening and analysis. By controlling fluid properties and the operational parameters, we can create monodisperse core-shell capsules and matrix particles, with a broad size range from 5 µm to 5 mm. At LLNL, microcapsules have been designed and produced for energy, biology, and commercial applications. The encapsulated form broadens the options for practical applications, increases the chemical shelf life, and improves the performance and efficiency. This talk will first showcase the use of microfluidics to achieve tailored microstructure production, and innovative microencapsulation of chemicals and species that would otherwise be difficult to use as-is. Then I will discuss examples of how machine learning and scale-up methods have impacted the usual production procedure. These are critical steps for lab technology to shorten the gap to meet industrial needs. Last but not least, the effort at LLNL to adapt lab technology to more diverse applications and commercial products will be discussed.

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***Bio**: **Congwang Ye** received his Ph. D. in Materials Engineering from Purdue University in 2015. He was hired as a post-doctoral research staff member at Lawrence Livermore National Laboratory after graduation and was then promoted to a research & development engineer in 2018. His research focuses on using microfluidic and related technologies to produce functional microcapsules and particles for specific applications. At LLNL, the major part of his work is the development of microfluidic-based capsule design and the subsequent scale-up production for industrial carbon capture and flue gas cleanup – a global mission to reduce CO2 emission. His work also includes using similar techniques to design and produce materials for a broad range of applications including cell immobilization, catalytic reaction, flexible displays, and laser target design. With years of experience to work closely with companies and institutions, Dr. Ye also leads the effort for technology transfer and commercialization.*