MECHANICAL ENGINEERING **SEMINAR**

"Quantifying Nano-Enhancement in Organic Phase Change Materials"

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•**Abstract:** Organic phase change materials (PCMs) use the latent enthalpy of the solid-liquid phase transition for energy storage. PCMs are useful as thermal barriers in construction materials for energy-efficient buildings, for energy storage using intermittent renewable power sources (e.g., solar and wind), and as a passive cooling mechanism for portable electronics. One current disadvantage of PCMs for energy storage lies in their low thermal diffusivity, which inhibits their ability to allow for uniform heating to achieve a full phase transition during heating or cooling. Therefore, researchers have investigated the use of nanoparticles to improve the thermal diffusivity of PCMs, and inconclusive results have been reached regarding the impact the nano-enhancement has had on the PCM. This problem is exacerbated when nanoparticle agglomeration is taken into account, and little work has been done on how the PCM molecular structure impacts the energy storage capability. Therefore, this talk discusses the creation of a multi-scale modeling framework to quantify the impact the PCM molecular structure and nano-enhancement have on the PCM performance, and conclusions are provided regarding how aspects of the nano- and micro-scalesimpact the overall bulk properties and performance of the nano-enhanced PCMs.

•**Biosketch:** Dr. Aaron Wemhoff is currently an Associate Professor and Director of Graduate Studies in the Department of Mechanical Engineering at Villanova University. He joined Villanova in 2008 after three and a half years as a Thermal-Fluids Engineer at Lawrence Livermore National Laboratory. He earned his PhD in Mechanical Engineering in 2004 from UC Berkeley. Dr. Wemhoff currently serves as Chair of the ASME K-20 Committee on Computational Heat Transfer, is Past Chair of the Philadelphia Section of ASME, and is a Regional Editor for the International Journal of Transport Phenomena. His research interests include computational heat transfer, microscale heat transfer, and energy efficient system design. He is the author or co-author of over 60 peer-reviewed publications and has either given, or mentored students in, over 40 additional presentations.

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