**Texas Tech University**
**Department of Chemical Engineering**
**Seminar Series**

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## Two-Dimensional Microbarriers for Environmental Protection of Dispersed Liquid Phases

**Abstract**

Fine particles can assemble at oil-water interfaces and stabilize droplets to form what is known as a Pickering emulsion. When 2-dimensional particles are used, the developed interfacial films demonstrate unique molecular barrier properties at the liquid-liquid interface, a phenomenon that is not observed with conventional isometric particles. These films are able to inhibit transport from the droplet interior and cause a significant suppression of a dispersed-phase evaporation rates with potential applications in environmental sequestration and/or controlled release. They are also able to protect the dispersed phase from attack by reactive oxygen species, which typically react at diffusion-limited rates.

Such encapsulation strategies have recently been expanded to aqueous/ metal interfaces using eutectic gallium- indium (EGaIn) alloys that are liquid at room temperature. These alloys are of particular interest for applications including self-healing circuitry, soft robotics, and flexible electronics, but are not without challenges. Trace amounts of oxygen will react with gallium and form an insulating skin layer, which can be a nuisance as it will adhere to most surfaces and leave behind undesirable residue, and also renders printing from the bulk metal liquid largely unfeasible. Encapsulation of liquid metals with 2-dimensional materials offers a new strategy for managing the liquid metal surface chemistry and tuning of particle properties. These composite particles can then readily be formulated into inks for implementation into incumbent printing technologies, and engender new technology classes of ultra-soft conductive devices and composites.

**Bio**

Dr. Creighton is currently serving a joint appointment as an Air Force Science and Technology Fellow and as a researcher in the mechanical engineering department at the Massachusetts Institute of Technology, hosted by Professor A. John Hart. Her current research investigates materials and process development for flexible electronics for military applications. Prior to her current role, she was a materials scientist in the 3M corporate research laboratories in St. Paul, MN. While there, she was the dedicated corporate subject matter expert for carbon materials with a focus on leveraging fundamental understanding to drive development of novel products and growth into new markets. She has a PhD in chemical and environmental engineering from Brown University, where she studied the environmental and health impacts of emergent carbon nanomaterials and was supported by a Science To Achieve Results (STAR) fellowship from the Environmental Protection Agency and a Graduate Assistance in Areas of Academic Need (GAANN) fellowship from the Department of Education.

**Wed. Jan 29th**
**Livermore 101**
**3:00 pm**