

# Institute Lecture

**Prof. Norman J. Wagner**

University of Delaware

**Micromechanics of Shear Thickening Fluids:  
Their Application as Protective Materials for Medical  
Professionals, First Responders, Athletes & Astronauts**



**@ 5 pm | Monday, December 9, 2019  
Venue: L17 (LHC)**

### **About the talk**

Shear thickening colloidal and/or nanoparticle suspensions are the basis of a technology platform for advanced, field responsive nanocomposites. Some of the experimental methods and key results concerning the micromechanics of colloidal suspension rheology will be reviewed in this lecture. The role of contact friction versus lubrication friction will be elucidated along with implications for formulation.

Shear thickening fluids (STFs) are novel field-responsive materials that can be engineered to be useful nanocomposites for enhanced ballistic and impact protection, puncture resistant medical gloves, energy absorbing materials for mitigating impacts and concussions, as well as in systems for mitigating puncture, micrometeoroid, and orbital debris threats in space applications. The development of commercial applications of STFs and some technological applications of STFs under commercial development, including use in astronaut protection and application in the Artemis Mission to the Moon as well as the Mission to Mars and the associated flight experiments on the International Space Station will be discussed.

### **About the speaker**

**Norman J. Wagner** is the Unidel Robert L. Pigford Chair in Chemical Engineering, University of Delaware, with affiliated faculty appointments in Physics & Astronomy, Biomechanics and Movement Science. He is President of the Society of Rheology, co-founder & director of the *Center for Neutron Science*. He was elected to the *National Academy of Inventors* (2016) and the *National Academy of Engineering* (2015). His research interests include the effects of applied flow on the microstructure and material properties of colloidal suspensions, polymers, self-assembled surfactant solutions, and complex fluids. He is the recipient of many awards including Fellow of the AAAS (2015), the Bingham Medal of the Society of Rheology (2014), Fellow of the Neutron Scattering Society of America (2014), AIChE PTF Thomas Baron Award (2013), Siple Award (2002) by the US Army for his development of shear thickening fluids for novel energy absorbing materials. He has authored over 200 scientific publications and patents. Prof. Wagner co-founded STF Technologies LLC in 2003 to commercialize his inventions for applications in personal protective equipment and astronaut protection for NASA.

**All are invited to attend  
Dean of Research and Development**