

Distinguished Lecture Series

presents

"Elasticity of Fluids in Nanopores: Molecular Modeling and Ultrasonic Experiments"

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Abstract

Fluids confined in nanopores are ubiquitous in nature and technology. In recent years, the interest in confined fluids has grown, driven by research on unconventional hydrocarbon resources -- shale gas and shale oil, much of which are confined in nanopores. When fluids are confined in nanopores, many of their properties differ from those of the same fluid in the bulk. These properties include density, freezing point, transport coefficients, thermal expansion coefficient, and, as it was shown recently, elastic properties.

The elastic modulus of a fluid confined in the pores contribute to the overall elasticity of the fluid-saturated porous medium and determine the speed at which elastic waves traverse through the medium. In this talk I will show how elastic modulus of a confined fluid in a nanopore can be calculated based on Monte Carlo and molecular dynamics simulations and illustrate it with calculations for various fluids. Additionally, I will present our recent experimental measurements of elastic properties of water confined in nanoporous glass samples. Our results suggest that some of the models widely used for describing elasticity of fluid-saturated porous solids need to be revised.

Biography

Dr. Gennady Gor is an associate professor at NJIT. He received a PhD in theoretical physics from St. Petersburg University, Russia, in 2009. He continued his research in the United States, first at Rutgers University, and then at Princeton University and Naval Research Laboratory. In 2016, he joined the faculty of NJIT.

The central focus of Dr. Gor's research is in interactions of fluids with porous materials. He is an expert in molecular modeling of fluid adsorption, known for his contributions to modern methods of adsorption porosimetry and the development of the theory of adsorption-induced deformation. His current research interests include confined liquids and electrolytes, atmospheric aerosols, lithium-ion batteries, and ultrasound propagation in porous media. Dr. Gor authored more than 70 peer-reviewed publications and is the recipient of the National Research Council Associateship (2014) and the NSF CAREER Award (2020)

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