August 5, 17:00-18:00
Online

Seminar

Molecular dynamics in ice and water: insights from broadband dielectric spectroscopy

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and Technology

Speaker introduction

Vasily received his Master degree in Applied Mathematics and Physics from the Moscow Institute of Physics and Technology in 2007 and a Ph.D. degree in Condensed matter Physics from the Prokhorov General Physics Institute in 2010. After the postdoctoral research at the Lomonosov Moscow State University and several stays in Germany, in particular, at the 1. Physikalisches Institut, Universität Stuttgart, he was heading the lab of intermolecular interaction spectroscopy for several years before he joined the Center for Energy Science and Technology at Skoltech. Vasily's research interests include electrochemical power systems, micro-and nano-fluidics, interfacial phenomena, dielectric spectroscopy, infrared spectroscopy, and ionic conductors. His first monography on the Electrodynamics of water and ice was published by Springer in 2021.

Invited by Professor Artem Oganov

Seminar abstract

Water is important to life and technology, but it is still unclear how the oxygen and the hydrogen atoms are linked together, providing the variety of properties that this pivotal liquid exhibits in nature. Broadband dielectric spectroscopy is a useful tool for the experimental analysis of molecular dynamics in water at the interval from the picosecond to the millisecond. In this talk, I will give a brief historical overview of the structures of water and ice and demonstrate new ideas that broadband dielectric spectroscopy and infrared spectroscopy can provide to the dynamic structure of water. The role of intermolecular proton transport and the quantum nature of protons will be discussed. I will show why ice and water, two forms of the same substance, look so different when they interact with electromagnetic waves, and what changes in their structures at the phase transition. Finally, I will demonstrate how fundamental knowledge transforms into practical applications in electrochemical energy systems and biophysics.

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