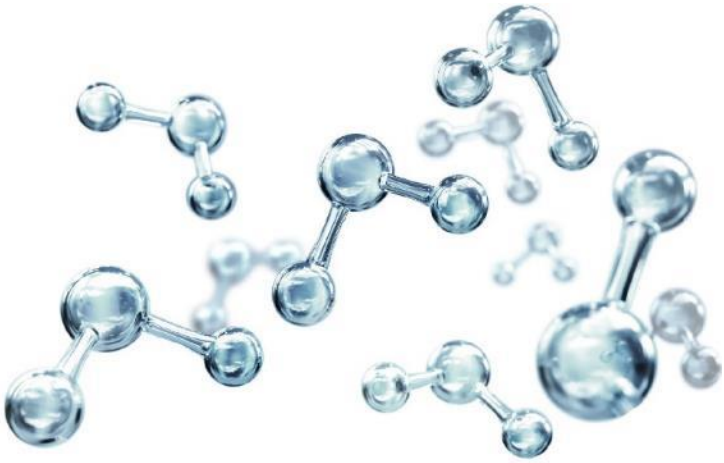
Seminar

CMWS Centre for Molecular Water Science

21st of November 2024
12:00 h



Zoom Virtual Meeting:

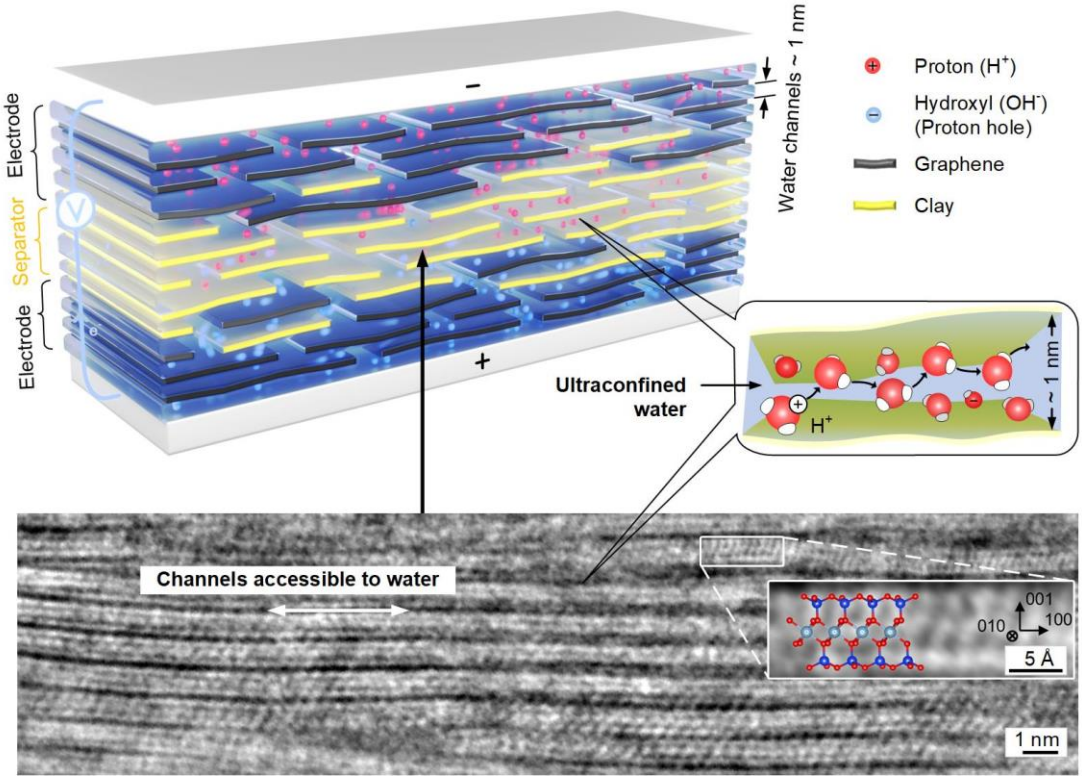
https://tuhh.zoom.us/j/82631283465
Meeting-ID: 826 3128 3465
Password: 978444

Vasily Artemov

École Polytechnique Fédérale de Lausanne

Ultraconfined water: the working fluid for blue devices

When water is confined between walls only a few molecular diameters apart, its behavior changes dramatically compared to bulk water, revealing new physical phenomena. Nature has long used this 'trick' to create functionalities that engineers have yet to explore fully. In this talk, I will delve into the electrodynamics of ultraconfined water, focusing on the fundamental principles and ‘golden rules’ that govern its dielectric response. I will present robust experimental data on water's conductivity and dielectric constant in a 1-nm nanochannel array, fabricated using cost-effective and scalable engineering. To illustrate potential applications, I will introduce 'blue devices' [1] – an emerging class of systems inspired by nature, with water-caused unique properties. I will demonstrate a simple water-and-clay blue device (see Figure) for electric energy storage, leveraging the water’s confinement-enhanced H^+ and OH^- ions. The talk is built on my 15-year exploration of water’s structure and electrodynamics [2] and will interest engineers, biophysicists, soft- and condensed matter researchers, and curious people looking for answers.



[1] V. Artemov et al., arXiv:2410.11983 (2024).
[2] V. Artemov, The Electrodynamics of Water and Ice, Springer (2021).