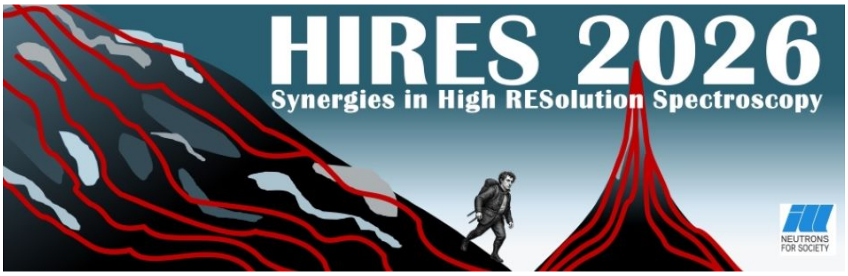

Contribution ID: **14** Type: **Oral**

Effect Surface Chemistry on the Properties of Nanoconfined Water

In many natural and technological settings, water exists not as bulk liquid but as thin interfacial films or within nanopores, where its behavior is strongly influenced by surface chemistry. These constraints can significantly alter hydrogen-bonding compared to bulk water, raising the question of whether surface chemistry can be deliberately tuned to control interfacial water properties.

Our research tackles this challenge using periodic mesoporous materials (PMOs) whose pore walls are functionalized with organic bridges to create nanoscale patterns with adjustable repetition lengths, hydrophilicity, ionic surface charge and H-bonding capacity [1]. With pore diameters of ~4 nm, these systems provide precise models for studying how molecular-scale heterogeneity shapes the physics of surface water.

We will present results from recent work where the structure and dynamics of water confined in the nanopores or adsorbed on the inner surface of PMOs were investigated by the combination of various high resolution quasielastic neutron scattering experiments [2,3] with broadband dielectric spectroscopy [4] and Raman spectroscopy [5] covering thus extended temperature and time scales.

References

1 Mietner Angew. Chem. Int. Ed., 56 12348 (2017)
2 A. Jani et al, J. Chem. Phys., 154, 094505 (2021)
3 A. Mozhdehei et al.J. Phys. Chem. C 2025, 12918311−18324 (2025)
4 B. Malfait et al. J. Phys. Chem. C, 125, 16864 (2021)
5 B. Malfait et al. J. Phys. Chem. C, 126, 3520 (2022)

This research was carried out as part of the DFG-ANR collaborative project (ANR-23-CE29-0028) for which we express our gratitude. DM and AM acknowledge funding by ANR-22-CE50-0002.

Session

Liquids

Primary author: MORINEAU, Denis (Institute of Physics of Rennes, CNRS-University of Rennes 1)

Co-authors: MORÉAC, Alain (Institute of Physics of Rennes); MOZHDEHEI, Armin (Institute of Physics of Rennes); OLLIVIER, Jacques (Institut Laue-Langevin); ZANOTTI, Jean-Marc (Laboratoire Léon Brillouin (CEA-CNRS) / CRG SHARP); Dr BUSCH, Mark (TUHH); Prof. FRÖBA, Michael (UHH); Prof. HUBER, Patrick (Hamburg University of Technology); Dr LENZ, Philip (UHH); BERROD, Quentin (CNRS SyMMES); LEFORT, Ronan (Institute of Physics of Rennes); Dr SCHWAKE, Sophia (UHH); GRIES, Stella; APPEL, markus (ILL)

Presenter: MORINEAU, Denis (Institute of Physics of Rennes, CNRS-University of Rennes 1)

Session Classification: Liquids