

Does nanoconfined water looks like bulk water?

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A lot is known about the properties of bulk water: its phase diagram, including non-trivial features, such as the so-called Widom line, other thermodynamic properties (e.g., isothermal compressibility and thermal expansion coefficient), its transport properties and much more, though the debate about its anomalies has kept (and is keeping) the scientific community for more than 50 years. Water in its liquid or gaseous/vaporous state can be confined within porous media of various size, shape and “chemistry” (more or less hydrophilic/phobic). How do its properties change under confinement? For example, does water under extreme confinement, contained within (strictly) nanometric or sub-nanometric pores, still present distinguished liquid and gas phases? Under this extreme confinement, when the number of water molecules in contact with the solid surface is comparable with those in the “bulk”, is it still meaningful to speak about the properties of water or should one rather consider the fluid/solid composite as a single system? Additionally, can one possibly tune the properties of the fluid (or composite) by changing the properties of the confining environment? Finally, can one exploit the (possibly tunable) properties of confined water for technological applications? In my talk I will try to address some of these questions and present the challenges ahead of us.