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Modelling solid-liquid interfaces and nanofluids for energy applications

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Abstract: This talk aims to discuss some multi-scale transport phenomena at solid-liquid interfaces, which are relevant in characterizing and designing materials for energy applications. We can distinguish two broad categories: interfaces where the solid phase prevails on the liquid one and those where the opposite holds. The first category includes engineered interfaces for optimizing the water uptake (adsorption/infiltration) isotherms into solid micro-/nano-porous materials. In this talk, I will investigate water-zeolite adsorption isotherms for thermal storage applications and water- zeolite infiltration isotherms for reverse osmosis applications. Concerning the second category, I will discuss the nanofluids, namely colloidal suspensions of engineered nanoparticles. In this case, the interfacial properties are determined by the nanoparticle surface, engineered by functionalizations, electrolytes and surfactants. The nanoparticle surface determines the properties of the solvent nanolayer effect, which is responsible of the solvation forces and consequently of the colloidal stability. In this talk, I will put some special emphasis on nanofluids for solar thermal engineering.