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Nano-ions in solution

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Beyond electrostatic, the interaction of ions with their close environment depends on their hydration shell and the water dynamic in this environment. Non-negligible water mediated effects can indeed influence many physical chemistry processes such as cloud point, protein salting-in or out, bubble coalescence, the topology of bilayers... They are thus qualified of "ion specific".
During the last 10 years, we have shown that these effects can be exalted with nanometric ions. These latter can indeed bind to electrically neutral matter in solution although highly charged but always characterized by low charge density. This nano-ion specific effect, called superchaotropic effect in referring to an extension of the Hofmeister series, arises from the partial dehydration of both the nano-ion and the solute or surface in interaction that lead to a significant gain in enthalpy of the system. The characterization of this effect is strongly supported by scattering experiments, neutron and x-ray, always in a very complementary manner and also by other spectral techniques that allow to precisely defined the predominant chemical functions in interaction with the nano-ions that can vary depending on their supramolecular environment.
Some examples and perspectives of these studies will be presented in this paper.

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