Polyoxometalates as a case study of super-chaotropes

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Ionic species, such as polyoxometalates (POMs) or (metal-) boron clusters, are at the frontier between ions and (charged-)colloids due to their nm size.[1a] We show here that the large size and low charge density of POMs, compared to classical ions, are responsible for a peculiar behavior called “super-chaotropy”. This property refers to the strong propensity of nano-ions to adsorb at neutral polar interfaces, via non-specific interactions. It has strong effects on phase transitions in soft matter and can, for example, give an explanation on the origin of the famous “POM-etherate” phase formation. A simple way for evaluating and classifying nano-ions, such as POMs, according to their super-chaotropy is proposed here.[1b] The super-chaotropic behavior of nano-ions opens opportunities in separation science,[2a] catalysis, and for the design of nanostructured hybrid materials.[2b]

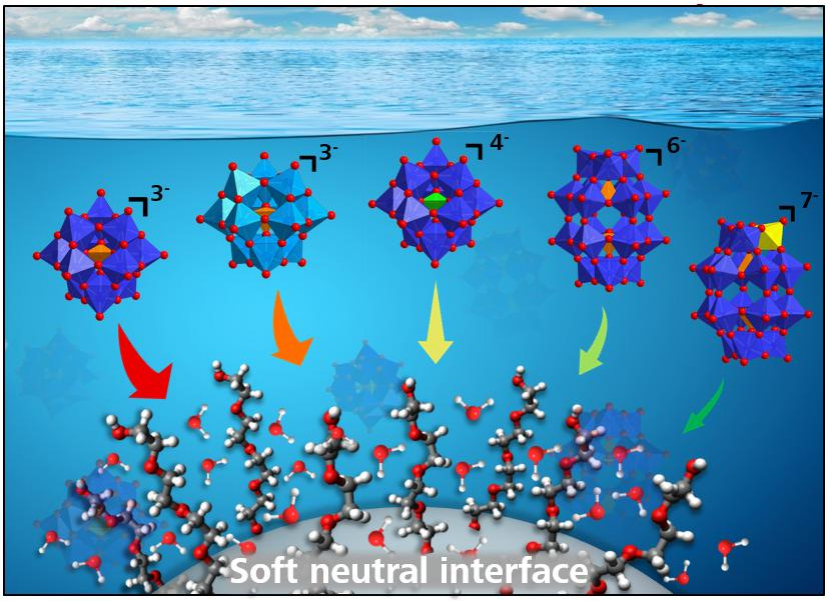

Figure 1 Nano-ions with delocalized charges, such as POMs, strongly adsorb on neutral polar interfaces. This property called “super-chaotropy” scales with the charge density and, to a lesser extent, with their polarizability.

(1) a) Malinenko, A.; Jonchère, A.; Maynadié, S.; Girard, L.; Diat, D.; Bauduin P. *Langmuir* 2018 http://dx.doi.org/10.1021/acs.langmuir.7b03640 b) Buchecker, T.; Schmid, P.; Renaudineau, S.; Diat, O.; Proust, A.; Pfitzner, A.; Bauduin, P. *Chem. Commun.* **2018**, 10.1039/C7CC09113C.

(2) a) Naskar, B.; Diat, O.; Rataj, V.; Bauduin, P. *J. Phys. Chem. C* **2015**, *119* (36), 20985. b) Buchecker, T.; LeGoff, X.; Naskar, B.; Pfitzner, A.; Diat, O.; Bauduin, P. *Chem. - A Eur. J.* **2017**, 23, 8434.