

Ions and the Liquid State

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Since centuries, salt containing liquids attract the interest of scientists. In the 19th century, Poiseuille looked at the viscosities of aqueous salt solutions, Hofmeister at the influence of salts on enzyme stabilities, Pfeffer at osmotic pressure, and Hittorf and Kohlrausch studied ionic electrical conductance, just to mention few examples.

In the meantime, the field significantly grew into various directions. Some people still look at the behaviour of more or less small ions water and try to build a bridge between the old salting-in and -out phenomena with other phenomena such as hydrotropic behaviour or “hydrophobic” ions combined with “hydrophilic” ones in so-called antagonistic salts. Also the new concept of nano-ions should be mentioned with partly new and surprising behaviours.

Charged hydrotropes – as well as uncharged ones – can even induce, what I called a “pre-Ouzo” effect, when mixed with an aqueous and an oil phase. In such a surfactant-free microemulsion, various, more or less well-defined structures similar to those in conventional microemulsions are found.

Further, specific ion effects have been detected in non-aqueous solvents. And finally, there is the interesting field of Ionic Liquids and Deep Eutectic Solvents, where specific characteristics of ions play a crucial role. I also want to give here my personal point of view on such systems, the prerequisites for such water-free ion-containing liquids and their possible usability beyond the ongoing hype with these systems.