New ways towards low toxic and liquid catanionics

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Conventional “catanionics” comprise blends of common anionic and cationic amphiphiles in which counterions like sodium or chloride are still present. In contrast, “ion pair amphiphiles” (IPAs) consist exclusively of the oppositely charged amphiphilic ions. Various aspects of such surfactant mixtures have been extensively studied during the last decades. The focus thereby was on the surfactant properties of catanionics, like the easy formation of highly stable bilayer structures in aqueous solution. However, the characteristics of pure blends have been neglected. Due to the strong interactions between the long hydrocarbon chains and the charged headgroups classical catanionics are prone to melt at very high temperatures.

In a previous work we found that with short-chain alkylether carboxylates it is possible to make simple room temperature ionic liquids [1]. This concept is now extended to surfactants. Indeed, it is possible to make room temperature liquid cationic surfactants and even combinations of cationic and anionic surfactants that are liquid at room temperature. Catanionics are known to have very interesting properties for example for encapsulation processes [2]. Their liquid state offers further potential applications. However, care must be taken to carefully choose cationic surfactants of low toxicity.

We present here low toxic catanionics in an attempt to take advantage of all our previous findings: to formulate aqueous systems containing low toxic combinations of cationic and anionic surfactants that might, in addition, be classified as ionic liquids.