

Surfactants with bimetallic polyoxometalate head group.

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Surfactants are the most important class of amphiphilic compounds. They are widely used in colloid chemistry and for the preparation of nanostructured materials. The hydrophilic head group of surfactants is typically organic in nature. Thus, it is envisioned that additional functionality of surfactants can be realized for those bearing a transition metal containing head group. Our task is the synthesis and exploration of novel surfactants with polyoxometalate (POM) head groups. POMs, due to their unique electronic and chemical properties, are important in diverse fields of science, e.g. catalysis, material science, biology and medicine.^[1] Lately, they have been used as versatile building blocks for functional materials.^[2] It could be shown that lacunary POMs are well suited for further chemical manipulation.^[3]

Here, a surfactant system with an anionic, lacunary polytungstate head group of the Keggin-type $[PW_{11}O_{39}]$ (see Fig. 1) is presented.^[4] These compounds exhibit the typical characteristics of amphiphiles. For instance, they form micelles, liquid crystal and they can be used for the preparation of emulsions. However, in comparison to classical surfactants they possess additional functional properties, for instance regarding catalytic activity. A case will be presented in which the POM-surfactant is the emulsifier for styrene and at the same time catalyzes its cationic polymerization.

The next level of complexity is a head group comprising two different sorts of transition metals (W & either Cr, or Ru, Ti, Eu, etc.). The electrochemical behavior and the effects on the self-assembly properties of such bimetallic surfactants will be discussed. Furthermore, it is reported that the bimetallic amphiphiles represent interesting systems for cooperative catalysis.

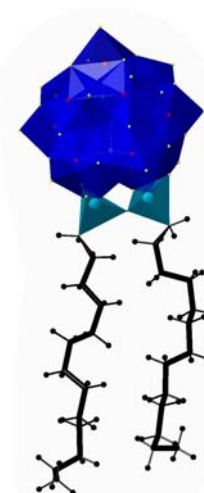


Fig. 1: A surfactant with a $[PW_{11}O_{39}]$ head group.

Literature:

[1] J. J. Borrás-Almenar, E. Coronado, A. Müller, M. T. Pope, *Polyoxometalate molecular science*, Springer, **2003**. [2] D.-L. Long, R. Tsunashima, L. Cronin, *Angew. Chem. Int. Ed.* **2010**, *49*, 1736. [3] A. Proust, R. Thouvenot, P. Gouzerh, *Chem. Commun.*, **2008**, 1837. [4] S. Landsmann, C. Lizandara-Pueyo, S. Polarz, *J. Am. Chem. Soc.*, **2010**, *132*, 5315.