Metal xanthates: a route to porous metal sulfide thin layers

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Many metal sulfides are of interest in various applications comprising luminescent devices, sensors, solar cells and many more. Among the various routes towards metal sulfides, we focus on a single source precursor route using metals xanthates. These are metal-organic compounds exhibiting a sulfur-metal bond, which decompose at relatively low temperatures (<200°C) resulting in highly pure metal sulfides via a mechanism called Chugaev elimination. Another advantage is the ability to control their properties (decomposition temperature, solubility) by changing the structure of the organic moiety of the xanthate group [1] and/or of adding additional ligands.

Our research is focused on the synthesis of hierarchically structured metal sulfide thin layers (ZnS, SnS_2) via metal xanthates, where the porosity is influenced by altering the chemical structure of the metal xanthate. As shown in Figure 1, this can be achieved either by introducing longer alkyl-groups into the xanthate group or by attaching additional ligands to the metal center. During the thermal decomposition of the xanthates, porous films are generated. The properties and features of the layers before and after xanthates' decomposition are studied via several techniques such as FT-IR and, UV-Vis spectroscopy, X-ray reflectivity and X-ray diffraction.

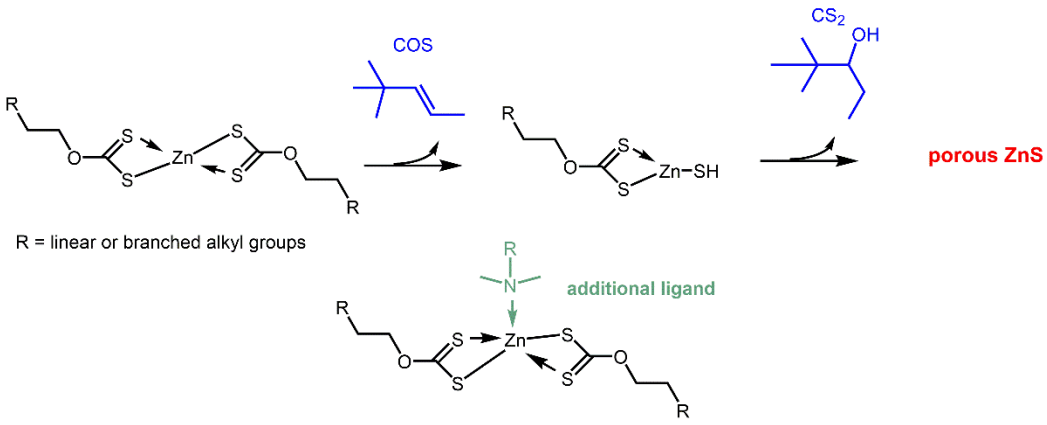

Figure 1

[1] Rath, T.; et al. Adv. Energy Mater. 2011, 1, 1046–1050.