

Influencing the morphology of supercrystals prepared by nanoparticle self-assembly

Annett Reichhelm, Danny Haubold, Alexander Eychmüller

Physical Chemistry, Technische Universität Dresden, Germany

Nanoparticles (NPs) possess unique properties which are suitable for optical and microelectronic applications. Due to their small size, the employment of NPs demands the preparation of superstructures which are large enough to be handled and integrated into technical devices. Supercrystals are three-dimensional assemblies of millions of nanoparticles with sizes up to some hundreds of micrometers. Similar to usual crystals, supercrystals exhibit symmetric shapes with defined facets and edges. The morphology of these crystals is strongly determined by the preparation conditions. For the tailoring of superstructures which are optimally adjusted to the respective application, the knowledge of the influencing factors is crucial.

In this study, we prepared supercrystals by the self-assembly of silver nanoparticles via a gas-phase diffusion method[1]. The resulting morphologies were investigated by scanning electron microscopy. Highly symmetrical supercrystals with triangular shapes have been obtained.[2] The size of the resulting superstructures has been tuned by varying the concentration of the initial NP solution. Thereby, supercrystals with diameters from 10 to 30 micrometers have been prepared. Additionally, an influence of the employed precipitation agent on the size has been observed.

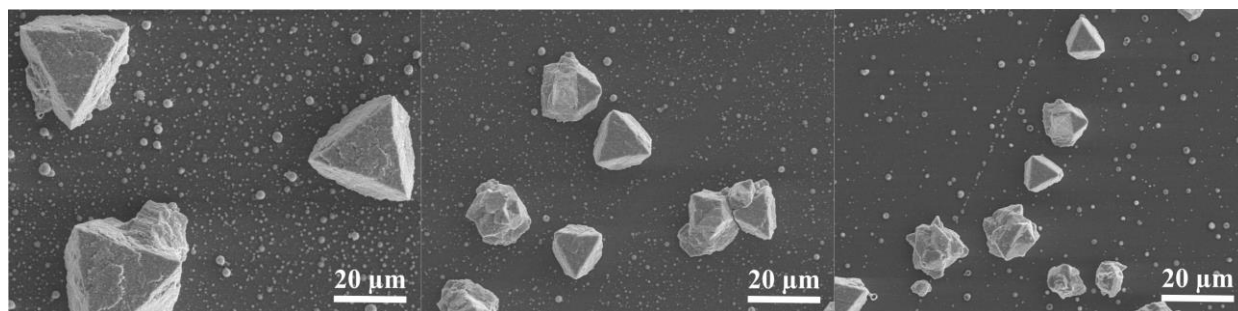


Fig. 1 Silver supercrystals with different sizes depending on the concentration of the initial NP solution.

1) P. Simon *et al.*, *Angew. Chem. Int. Ed.*, **2012**, 51, 10776.

2) D. Haubold *et al.*, *Adv. Funct. Mater.*, **2016**, 26, 4890.