Synthesis of highly monodispersed quartz nanocrystals from chemically functionalized amorphous silica nanoparticles

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Silica is a mineral commonly found in nature and has been widely employed in industrial fields. Its amorphous form, known as glass, can be transformed to crystalline α-quartz under hydrothermal conditions. We are currently developing synthetic routes towards quartz nanocrystals from chemically functionalized amorphous silica nanoparticles (ASNs) under hydrothermal condition. Because of facile Stöber synthesis with a high yield and excellent stability ASNs can be an ideal platform to study amorphous-to-crystalline phase transformations.

As-prepared ASNs and quartz nanocrystals have been characterized by various characterization techniques such as transmission electron microscopy (TEM), scanning electron microscopy (SEM), powder X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR), and X-ray photoelectron spectroscopy (XPS). Thermal analysis methods such as thermogravimetric analysis (TGA) was used to monitor the transformation processes. The results on the formation, effect of surface modification with various silane coupling reagents, as well as the potential mechanisms of transformation will be discussed in the presentation.