Controlling the Shape of Metal Oxide Nanostructures with Lyotropic Liquid Crystal Template

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Variations in size and shape can have a profound effect on the physical properties of nanomaterials. In terms of metal oxide nanoparticles – a diverse group of materials with applications in everything from medical imaging and drug delivery to energy storage and catalysis - there are a number of methods available for creating particles of various sizes, but few general methods that allow for control of the shape of these materials beyond simple spheres. To address this, we have modified existing aqueous synthetic methods [1] with lyotropic liquid crystals (LLCs), which act as templates that change the morphology of the products. The LLCs form a range of different phases that can alter the growth mechanisms of metal oxide nanomaterials, allowing for the formation of nanosheets [2], plates (see Fig. 1), and disc-like structures. We will show the ability of this method to alter the morphology of a variety of nanomaterials including iron, manganese, ruthenium and zinc oxides.

In addition, we will show how the shape and surface chemistry affect cell uptake [3] and transport across brain endothelial cell monolayers [4] serving as mimics of the blood brain barrier.

References:

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