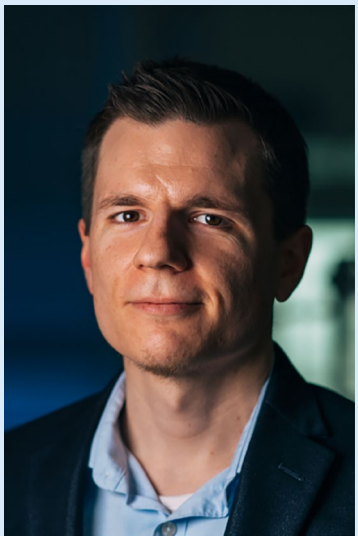
INORGANIC CHEMISTRY SEMINAR



Prof. Robert Macfarlane

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“Macroscopic Materials from Nanoparticle Assembly”

Abstract: One of the promises of nanotechnology in its early developmental stages was the ability to make designer materials with precise control over individual building block composition and organization in 3D space. In recent years, material synthesis methods have advanced to be able to create a multitude of nanoparticles of varying sizes, shapes, and compositions, providing a vast array of building blocks to use as materials fabrication components. Additionally, processing methods have been developed to arrange these nanoparticles into ordered arrays, to dry them into thin films, and even to sinter them into more complex bulk materials. However, the fundamental promise of being able to build a material with controlled structure across the length scales of atomic crystal structure, nanoscale size, shape, and organization, and ultimately material microstructure and macroscopic form has been challenging to realize. A major advancement would therefore be a materials synthesis and processing route that could create free-standing, macroscopic materials or arbitrary three dimensional shapes with precisely controlled nanoparticle positions across the entirety of the material composition. Here, we demonstrate a nanoparticle-based building block called a “Nanocomposite Tecton (NCT)” that enables a self-assembly route to fabricating free-standing solids of arbitrary macroscopic shapes that can utilize a multitude of different nanoparticle compositions and shape, and also possess specifically programmed nanoscale particle arrangements and controlled microstructure. This talk will outline the key synthesis and processing steps that enable this method of making materials with programmed material structure across ~7 orders of magnitude in length scale, thereby realizing a long-standing goal of nanomaterials fabrication.

Wednesday, February 9th 2022

4:00 p.m. | Mol Sci 3440

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