Chem Sci J 2017, 8:3 (Suppl)
DOI: 10.4172/2150-3494-C1-012

Self-assembly of rhenium selenide clusters into layered platelets directed by long-chain amines

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During the past decades, the versatility of Wet Chemistry allowed the synthesis of a variety of layered nanomaterials in the form of platelets, single-layer sheets, nanoflowers or nanotubes. Sometimes, the growth of these nanostructures is templated by amphiphilic molecules (those which present both polar and non-polar regions), which may remain as a stabilizing agent after the synthesis. In general, the structure of layered materials consists of a continuous network of atoms covalently bonded within the layer, while the interactions between the layers are usually weak van del Waals forces. Many research efforts have been devoted to the synthesis of layered materials with a continuous structure; however the development of chemical routes to synthesize novel families of layered materials which incorporate smaller building units such as clusters and chains in their structure remains a challenge. These materials should present interesting quantum confinement effects and novel functionalities. In this work, we present a simple Wet-Chemistry method to synthesize a plate-like hybrid material composed of clusters of rhenium selenide and long-chain amines. The amines, which are linked to the clusters as a ligand, act as a templating agent due to their self-assembly ability, thus forming platelets with sizes of several microns composed of 15-20 alternated layers of amines and clusters. Moreover, there materials can be used as a reservoir of clusters which, conveniently released by a simple acid-base reaction, have been successfully incorporated to the surface of graphene.

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