Inorganic Nanotubes And Fullerene-like Structures (IF): Progress Report

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Abstract. In this presentation a progress report, focused mainly on the results obtained in our lab will be presented. While the synthesis and study of IF materials from layered metal dichalcogenides, like WS_2 and MoS_2 remain a major challenge, some progress with the synthesis of IF structures from other compounds, like metal oxides and metal halides have been realized. The synthesis of some new IF materials, like Cs_2O, $NiBr_2$ and others will be described.

The study of the mechanical properties of individual WS_2 nanotubes will be discussed in some detail. The agreement between theory and experiment suggests that the nanotubes are of high crystalline order and their mechanical properties are predictable.

The study of MoS_2 nanooctahedra 3-6 nm in size, which can be considered to be the true inorganic fullerenes of these and many other layered structures, will be discussed. The agreement between the calculated and experimentally observed structures indicate that the nanooctahedra are indeed the stable structures in this size range, beyond this size the quasi-spherical nested MoS_2 structures become stable.

Some new potential applications for these and related materials will be discussed in the fields of friction reduction of various objects; catalysis; rechargeable batteries, coatings, etc. will be discussed as well. To capitalize on these opportunities, a production facility for up to 100 kg/day of IF-WS_2 has started operating recently.