

**Inorganic nanotubes and inorganic
fullerene-like materials from layered
compounds**

Reshef Tenne¹

¹Weizmann Institute of Science
Department of Materials and Interfaces
Rehovot 76100
Israel

We have proposed that nanoparticles of layered compounds will be unstable against folding and close into fullerene-like structures and nanotubes (IF). Initially this hypothesis was realized in WS₂ and MoS₂. Subsequently, nanotubes and fullerene-like structures were prepared from numerous compounds of 2D habit. Much progress has been achieved in the synthesis of inorganic nanotubes and fullerene-like nanoparticles of WS₂ and MoS₂ and many other metal dichalcogenides over the last year or two. Synthetic methods for the production of multiwall WS₂ nanotubes by sulfidizing WO₃ nanoparticles have been described and further progress is underway. A fluidized-bed reactor for the synthesis of 40-50 g of fullerene-like WS₂ nanoparticles has been established and reported. The detailed mechanisms for the synthesis of fullerene-like WS₂ and MoS₂ nanoparticles and nanotubes of these compounds have been elucidated. Single wall MoS₂ and nanooctahedra of MoS₂ were reported recently.

The optical and electronic properties of IF-WS₂ have been studied in some detail and compared to theoretical predictions. They indicated that these nanoparticles are semiconductors. In contrast to quantum dots, the bandgap was found to decrease with decreasing nanoparticle diameter. Alkali-metal intercalation and deintercalation in IF-MS₂ (M=Mo,W) nanoparticles has been recently demonstrated. The mechanical and tribological properties of these nanoparticles will be also discussed in brief.