conferenceseries.com

Alla Zak, Res. Rev. J Mat. Sci. 2017, 5:5
DOI: 10.4172/2321-6212-C1-004

11th International Conference on

ADVANCED MATERIALS & PROCESSING

September 07-08, 2017 | Edinburgh, Scotland

Alla Zak

Holon Institute of Technology, Israel

Single wall and multiwall WS_2 nanotubes synthesis and characterization - The update

The discovery of inorganic nanotubes (INT) of layered transition metal dichalcogenides (MoS_2 and WS_2) more than two decades ago opened the new research field in a solid state chemistry and in nanomaterials science. However, wide investigation of their properties and applications require the preparation of pure phase powders and in significant amounts. Careful study of the growth mechanism of WS_2 multiwall nanotubes (MWINT) resulted in pure phase INTs production and suggested their simple scaling up. The obtained nanotubes are of 30–170 nm in diameter and 5-25 micron in length, of perfect crystallinity and needle-like morphology. In addition, we have demonstrated that single- to triple-wall WS_2 nanotubes (SWINT), of 3-7 nm in diameter and 20-200 nm in length, can be produced by high-power plasma irradiation of big multiwall WS_2 nanotubes. Being of single or few-layers wall width these nanotubes promise to be of unusual electro-optical characteristics, which are under study nowadays. Very similar in their properties, the MoS_2 and WS_2 compounds demonstrate significantly different behavior during their synthesis from corresponding oxides through gas-phase high temperature reaction. Instability of precursor MoOx against reduction in high temperature processes makes INT-MoS_2 production very challenging and become an obstacle in the way of their reproducible preparation during these years. Finally, we can report on the reproducible, catalyst free and aspect ratio controlled synthesis of MoS_2 inorganic nanotubes (INT) from molybdenum oxide. The obtained nanotubes are of 10-20nm, 40-80 nm or 100-300 nm in diameter, and lengths - up to tens of microns, depends on reaction parameters. INT of MoS_2 are both 40% lighter and 40% stronger compared to the analogous WS_2 nanoparticles and hence more beneficial for tribological and composite applications. Being semiconductors, both MoS_2 and WS_2 nanotubes are good candidates forphotovoltaics and optoelectronics.

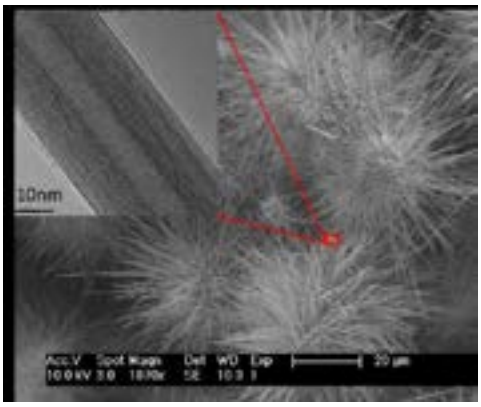

Figure: *SEM micrograph of INT-WS2, insert – TEM image.*

Biography

Dr. Alla Zak is a Head of the Laboratory for Synthesis and Investigation of Nanomaterials and Senior Lecturer in the Faculty of Science in the HIT-Holon Institute of Technology, Israel. She is also a Scientific Adviser in the Department of Materials and Interfaces in Weizmann Institute of Science (WIS), Israel. She has made a major contribution to the study of the growth mechanism and scaling-up of the fullerene-like (IF) nanoparticles of WS_2 and the inorganic nanotubes (INT) of WS_2 and MoS_2. The IF-WS_2 nanoparticles are now fully commercialized as superior solid lubricants. Furthermore, she was among the early researchers to show the importance of the WS_2 nanoparticles and nanotubes as reinforcing elements in polymer nanocomposites.

alzak@hit.ac.il