

Deconvolution of Anomalous Fast Fourier Transform Patterns for Tin Sulfide

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Abstract : The crystal structure of Tin Sulfide prepared by certain chemical methods is investigated using High-Resolution Transmission Electron Microscopy (HRTEM), Scanning Electron Microscopy (SEM), and X-ray diffraction (XRD) methods. An anomalous HRTEM Fast Fourier Transform (FFT) exhibited a central scatter of diffraction spots, which is surrounded by secondary clusters of spots arranged in a hexagonal pattern around the central cluster was observed. FFT analysis has revealed a long lattice parameter and mostly viewed along a hexagonal axis where there many columns of atoms slightly displaced from one another. This FFT analysis has revealed that the metal sulfide has a long-range order interwoven chain of atoms in its crystal structure. The observed crystalline structure is inconsistent with commonly observed FFT patterns of chemically synthesized Tin Sulfide nanocrystals and thin films. SEM analysis showed the morphology of a myriad of multi-shaped crystals ranging from hexagonal, cubic, and spherical micro to nanostructured crystals. This study also investigates the presence of quasi-crystals as reflected by the presence of mixed local symmetries.

Keywords : fast fourier transform, high resolution transmission electron microscopy, tin sulfide, crystalline structure

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