TRANSMISSION ELECTRON MICROSCOPY SEARCH FOR DEFECTS AND DISORDER CAUSING THE LOW THERMAL CONDUCTIVITY OF Zn_4Sb_3

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The exceptionally low thermal conductivity of the excellent thermoelectric material Zn_4Sb_3 [1] is attributed to nanodomains and disorder at different length scales.

Synchrotron x-ray diffraction studies suggest a fraction of the Zn atoms at crystal positions different from the main position [2]. Furthermore, there is evidence of domains less than 10 nm in size within the material [3]

In our transmission electron microscopy study at room temperature, the diffraction patterns show no indication of twin formation, superstructure reflections of diffuse short-range ordering scattering. The diffraction patterns, using a parallel incident beam, signal high crystal perfection within the crystal grains. However, a random distribution of Zn atoms and planar faults can not be ruled out at present because they do not show up by qualitative inspection of diffraction patterns. Bright-field, dark-field and high spatial resolution imaging reveal features of size around 10 nm. Some of these features are attributed to ZnO islands while there is evidence that others have a different nature.

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[3] H. J. Kim et al. Phys. Rev. B **75**, 134103 (2007)

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