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Low-temperature Synthesis of CdTe/Te Core-shell Hetero-nanostructures by Vapor-solid Process

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Heterostructures has unique and important properties, which may be helpful for finding many potential applications in the field of electronic, thermoelectric, and optoelectronic devices. We synthesized CdTe/Te core-shell heterostructures by vapor-solid process at low temperatures using a quartz tube furnace. Two step vapor-solid processes were employed. First, various tellurium structures such as nanowires, nanorods, nanoneedles, microtubes and microrods were synthesized under various deposition conditions. These tellurium nanostructures were then used as substrates in the second step to synthesize the CdTe/Te core-shell heterostructures. Using this method, various sizes, shapes and types of CdTe/Te core-shell structures were fabricated under a range of conditions. These structures were analysed by scanning electron microscopy, high resolution transmission electron microscopy, and energy dispersive x-ray spectroscopy. The vapor phase process at low temperatures appears to be an efficient method for producing a variety of Cd/Te hetero-nanostructures. In addition, the hetero-nanostructures can be tailored to the needs of specific applications by deliberately controlling the synthetic parameters.

Keywords: Cadmium telluride, Core-shell structure, VLS, TEM