

Diluted Ferromagnetic Semiconductor in a Cr-Based MnTe Thin Film

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$\text{Mn}_{1-x}\text{Cr}_x\text{Te}$ ($x = 0.05, 0.1, 0.15$), a single phase of high crystalline quality, was successfully grown on a Si(100):B substrate by using molecular beam epitaxy (MBE). An investigation on the magnetic and the electric transport properties of the $\text{Mn}_{1-x}\text{Cr}_x\text{Te}$ ($x = 0.05, 0.1, 0.15$) films shows ferromagnetic properties unlike antiferromagnetic bulk MnTe materials. The temperature dependence of the magnetic susceptibility in the film with $x = 0.10$ exhibits a sharp ferromagnetic transitions at around 175 K. An obvious semiconducting behavior is shown in the temperature range from 20 K up to 300 K. Our X-ray results and magnetization data have verified the ferromagnetism for preparing Cr-cluster-free magnetic semiconductor thin films as candidate materials for potential spintronic applications.

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