Poster

GROWTH AND CHARACTERIZATION OF CdTe NANOCRYSTALLINE FILMS

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The pulsed laser deposition (PLD) technique has been used to deposit thin films of CdTe. In this technique, pulses of ultraviolet light from an excimer laser are used to vapourize a CdTe target. This results in a plume of atomic species that rapidly expands normal to the target's surface. Material from the plume then lands on a heated substrate to form a thin film. For CdTe, this process is normally carried out under vacuum conditions. If instead, it is carried out in the presence of an inert, high pressure, background gas, then the PLD process is fundamentally changed. The presence of the background gas inhibits the expansion of the plume giving rise to the densities, time scales and energies needed to reconstitute CdTe nanoparticles within the plume. Films deposited under these conditions form from the arrival of nanoparticles at the substrate's surface. This work will compare the properties of CdTe films that have formed from the arrival of nanopaticles with those produced through conventional means.

The films that showed the strongest nanoparticle signature were deposited on (1 0 0) silicon at low temperatures in helium at 100 Torr. The x-ray diffraction data for such a film is shown in Fig. 1. The film is of poor crystallinity, but with weak peaks associated with the hexagonal wurtzite crystal structure (a=0.454 nm and c=0.745 nm). While the hexagonal phase is obvious, it is difficult to discern if the zinc blende cubic phase (a=0.645) is also present as its most prominent peaks overlap with the hexagonal phase. The surface morphology of the film (Fig. 2) is porous and disconnected as expected for a film formed from the clustering of many small particles. Room temperature photoluminescence measurements (Fig. 3) show a weak band edge emission at 2.83 eV, which corresponds to an emission maximum of 438 nm.

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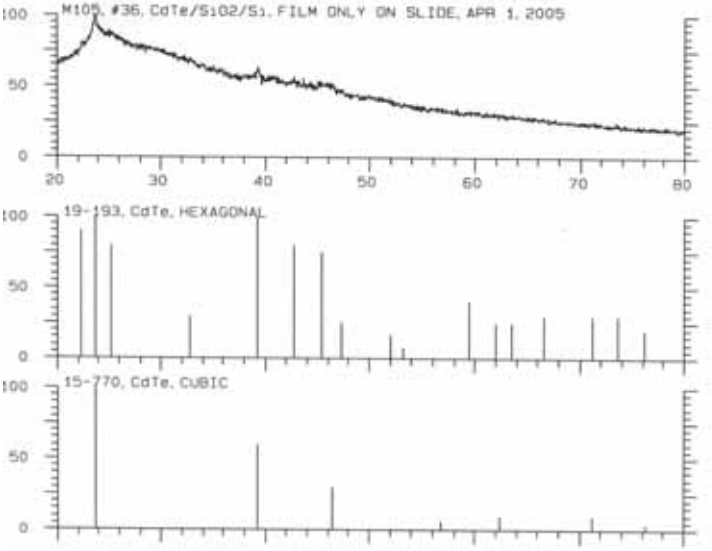

Figure 1. XRD of CdTe nanoparticles

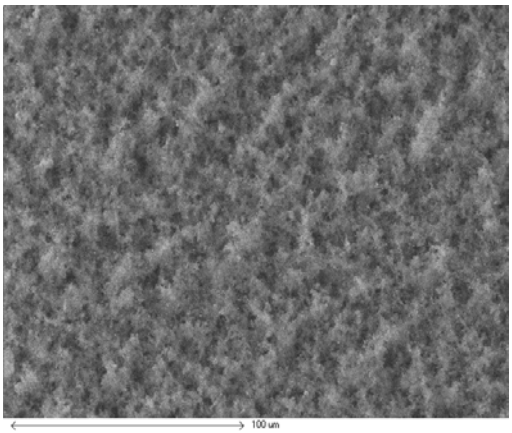

Figure 2. SEM of CdTe nanoparticles

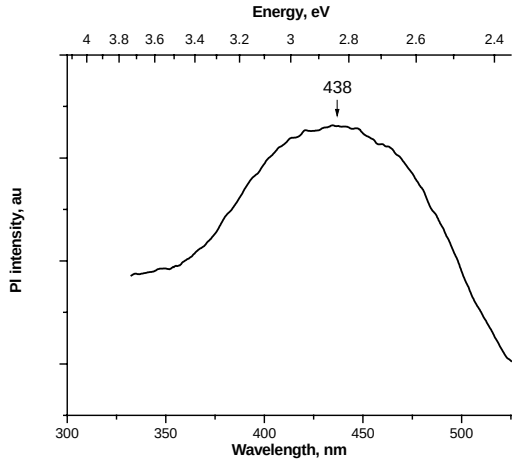

Figure 3. Room temperature photoluminescence in CdTe nanoparticles