Thin films of CdS nanocrystals embedded in Al₂O₃ matrix have been produced by magnetron rf-sputtering at room temperature and were characterised by Grazing incidence X-ray diffraction (GIXRD), high-resolution transmission electron microscopy (HRTEM) and electron diffraction (ED) techniques.

HRTEM shows evidence of the growth of CdS nanocrystals at room temperature with sizes in the range of 3 – 8 nm. Depending on the experimental parameters, two types of elongated or spherical nanocrystals could be obtained. Type 1 samples present a preferred growth along the c-axis, related to the incident beam. In type 2 samples, there is no evidence of a preferred growth orientation. Type 1 crystals have a non-spherical shape with an average size of about 7.5 nm in the (002) direction and 4.0 nm in the (103) one. Type 2 crystals have a near-spherical shape with near 4 nm mean diameter. It also showed that they tend to crystallise in the cubic phase (zinc blende structure) during the early stages of film growth, but the growth process leads to the evolution of a mainly hexagonal phase.

Stress-free films were formed under selected deposition conditions. GIXRD studies indicated that as-grown films are under tensile stress which evolves to compressive stress when the films are annealed. The as-deposited type 2 samples did not show the presence of stresses in the material, and no changes were observed from XRD patterns after annealing the samples.