

# **Influence of growth parameters on structural characteristics of nano-crystalline Si thin films for solar cell applications**

## **Αγγλική Περίληψη**

The present thesis concerns the structural characterization of polycrystalline silicon (Si) thin films grown by Al-induced crystallization method, resulting in the simultaneous crystallization and p-doping of amorphous Si thin films on n-type Si substrate, for use as the emitter in crystalline Si solar cells. The films growth was carried out at the Institute of Nanoscience and Nanotechnology (I.N.N.) of NCSR "Demokritos". A series of samples was grown under different conditions, with different nominal thickness (10 and 20nm) and different annealing temperature (430 and 500°C) and time (6 and 10h). The main objective is the study of the effect of these parameters on the films' quality using the transmission electron microscopy method (TEM), carried out at the Electron Microscopy Laboratory at the Physics Department of Aristotle University of Thessaloniki. Plane View and Cross Section observations clearly revealed the growth of a nano-crystalline Si layer (c-Si), with a thickness of up to 10nm, with the direction [111] mostly perpendicular to the substrate surface (100). However, in the samples with nominal thickness 20nm, nanocrystallized regions were observed in the amorphous layer with the larger lateral dimensions recorded for maximum temperature and annealing time. The growth conditions showed a negligible effect on the nanocrystalline silicon and the amorphous layer (with or without nanocrystallites) thicknesses. Cross sectional observations showed no Al residues which could act as free carrier recombination centers in the c-Si and thus degrade the photovoltaic cells efficiency.