

TEM and SEM investigation of AZO thin film microstructure

Corresponding author:

Petra Šotová, sotova@ntc.zcu.cz, University of West Bohemia, New Technologies - Research Centre

Co-authors:

Petr Novák, Rostislav Medlín

Abstract:

The aim of this work is describing of structure of sputtered transparent conductive aluminium-doped zinc oxide (AZO) thin films. The main attention was focused on their lateral size and orientation of the grains. The structural properties of the samples were studied by scanning electron microscope (SEM) and locally also by transmission electron microscope (TEM). The SEM analysis was used for investigation of surface morphology. Digital Micrograph and NIS-Elements were used to define the grain boundaries, which strongly affects the electrical properties. The TEM analysis of cross-section reveal that the sputtered films have a columnar structure whose lateral size increases with distance from the substrate. There were also calculated the interplanar spacing for each grain in HR-TEM images. In this work there were also the angles between the grains and substrate measured, so based on data we can estimate dependancy on the size of the angle. The data suggest that planes with a low angle of inclination from the substrate grow to the surface and outgrow the planes with a high angle of inclination. The low-oxygen AZO film was studied for the quantity of dislocations, according to the choosen HR-TEM image the dislocation density was about 10^{16} nm^{-2} . These data will be furtherly exploited in future research.

Key words:

Thin film, AZO, microstructure, SEM, TEM