Characterization of Columnar Structure of Sputtered AZO Films by Electron Microscopy for Grain Boundary Scattering Model

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Abstract. Grain boundary scattering reduces the mobility of free carriers in polycrystalline transparent conductive oxides. This is particularly significant in a sputtered low-thickness Al doped ZnO (AZO) films prepared at low deposition temperatures as the films often exhibit columnar structure and the density of boundaries influences its electrical properties. Unfortunately, this parameters cannot be easily estimate by the X-ray diffraction and the more sensitive analytical method is necessary. The aim of this work was to use electron microscopy to characterize the structure of sputtered AZO films and to evaluate a lateral grain size, which could be used for a grain boundary scattering model. The work is mainly focused on the characterization of the film structure close to substrate by transmission electron microscopy.