XRD and Electron Diffraction Synergies for Textured Thin Films Structure Investigation

Rostislav Medlín [1, a)], Pavol Šutta [1)], and Petr Novák [1)]

[1] *New Technologies Research Centre, University of West Bohemia, Univerzitní 8, 306 14 Pilsen.*

[a)] Corresponding author: medlin@ntc.zcu.cz

Abstract. In this study, Titanium (Ti) doped zinc oxide (ZnO) thin films were successfully deposited by reactive magnetron co-sputtering in a reactive mode from metallic targets with different Ti concentrations (up to 9 at % of Ti) at relatively low temperatures (~ 200 °C) to investigate changes of the microstructure. Detailed crystal and local atomic structures of the films were characterized via X-ray diffraction (XRD) and on cross-section X-TEM samples on HR-TEM together with electron diffraction (ED) patterns. Obtained results revealed that substitution of Zn sites by Ti ions degrade original hexagonal wurtzite phase of ZnO with increasing doping concentrations through ZnO:Ti-like to $ZnTiO_3$-like materials with a small amount of TiO_2 (anatase phase). This study clearly suggests that investigations of textured samples by two geometries of XRD together with 1D and 2D XRD detectors have its limitations and cooperation with X-TEM ED results can lead to better understanding of highly-textured materials.