

# Suppression of the green emission, texturing, solute-atom diffusion and increased electron-phonon coupling induced by Ni in sol-gel ZnNiO thin films

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© 2018 Zn<sub>1-x</sub>Ni<sub>x</sub>O thin films (nominal x=0, 0.01, 0.02, 0.04, 0.1 and 0.2) were synthesized on silicon substrates through a sol-gel/dip-coating technique. Samples were studied by X-ray diffraction, scanning electron microscopy, photoluminescence spectroscopy, Rutherford backscattering spectrometry and depth-profiling X-ray photoelectron spectroscopy. The results from X-ray diffraction show growth in the wurtzite crystal structure for all samples, with cubic NiO being detected as a secondary phase for x = 0.2. While for x = 0 (pure ZnO) no texture is present, for 0 < x < 0.1 strong preferential crystallization along the c-axis is observed. A tendency for Ni diffusion towards the film/Si substrate interface was observed. The formation of substitutional Zn<sub>x</sub>Ni<sub>1-x</sub>O solid solution for 0.01 < x < 0.04 is suggested by the results. Photoluminescence spectra exhibit strong near band edge UV emission and suppression of deep defect-related emission in the visible upon Ni<sup>+2</sup> incorporation into the ZnO