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Diffusion Studies in Al_2O_3/ZnO Cylindrical Hybrid Nanostructures

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Reaction diffusion has been studied in Al_2O_3/ZnO system in cylindrical geometry on the nanometric scale. Suppose that the sample geometry is closed cylindrical or spherical, the stress free strain fields which are developing during the solid state reaction-diffusion process, will not relax easily. The relaxation will certainly depend on the shape and size of the sample and for example a radius dependence of the processes are also expected. In order to study that, metal oxide layers were deposited by Atomic Layer Deposition (ALD) method on Pt nano-column templates built by Gas Injection System in Dual Beam Equipment. We studied how the inner radius of the cylindrical template influences the solid state reaction. In order to do this, samples were annealed for different periods. The reaction product has been identified by X-ray diffraction measurements as $ZnAl_2O_4$ gahnite phase. The kinetics as well as the radius dependence of the intermetallic phase growth was followed by Scanning, Scanning Transmission as well as Transmission Electron Microscopy.