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Interface formation in ALD-based SnO_2/CeO_x heterostructures — •Dominic Guttmann[1], Rudi Tschammer[1], Carlos Morales[1], Malgorzata Kot[2], Michal Mazur[2], Damian Wojcieszak[2], Paulina Kapuscik[2], Wiktoria Kolodzinska[2], Jarosław Domaradzki[2], and Jan Ingo Flege[1] — [1]Applied Physics and Semiconductor Spectroscopy, BTU Cottbus-Senftenberg, Cottbus 03046, Germany — [2]Faculty of Electronics, Photonics and Microsystems, WUST, 50-372 Wroclaw, Poland

The electrical resistance of SnO_2 ultrathin films (< 20 nm) made by atomic layer deposition (ALD) strongly depends on thickness, due to intrinsic film defects at interfaces arising from changes in the ALD reaction mechanism during the first cycles and from the film/substrate interaction. Modifying interface properties in SnO_2/CeO_x heterostructures can enhance H_2 sensing performance. We studied the initial growth of SnO_2 by ALD on CeO_x substrates prepared by either electron beam evaporation (EBE) or ALD. Employing the commercial precursor tetrakis(dimethylamino)tin (TDMASn) and ozone (O_3) as well as in vacuo and near-ambient-pressure X-ray photoelectron spectroscopy, we examined how substrate preparation affects the SnO_2 nucleation behavior in the first cycles. SnO_2 growth on EBE-CeO_x indeed starts with the first precursor cycle, whereas ALD-CeO_x requires an additional conditioning step. Connecting these findings to surface chemistry, distinct C1s and N1s signatures attributed to TDMASn adsorption indicate a slow C/N buildup, consistent with previous reports on ALD-grown SnO_2 on Si, SiO_2, and Al_2O_3.

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