Contribution submission to the conference SurfaceScience 2021

XPS and UPS investigation of an ALD prepared Al_2O_3/ZnO heterojunction — •Christoph Janowitz[1], Ali Mahmoodinezhad[1], Franziska Naumann[2], Paul Plate[2], Karsten Henkel[1], and Jan Ingo Flege[1] — [1]Brandenburg University of Technology Cottbus-Senftenberg, K.-Zuse-Str. 1, 03046 Cottbus, Germany — [2]SENTECH Instruments GmbH, Schwarzschildstraße 2, 12489 Berlin, Germany

The band alignment of two large band gap oxides was studied by a combination of XPS and UPS using consecutive sputter steps to unravel the electronic structure and elemental composition of each layer and the interface region. An Al_2O_3/ZnO heterointerface (10 nm Al_2O_3 on 59 nm ZnO) was grown on top of a Si single crystal substrate by consecutive thermal and plasma-assisted atomic layer deposition (ALD) respectively. The valence band maximum of Al_2O_3 was found to be 1.1 eV below that of ZnO, the conduction band minimum 2.3 eV above, resulting in a type-I staggered heterojunction. A reduction of ZnO to elemental Zn in the interface region was detected by the apparent shoulder of the Zn 2p and 2s core levels and by the Zn LMM Auger. This suggests an ALD interface formation mechanism different from previous models identified for other heterointerfaces.

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