DS 34: Atomic Layer Deposition

Time: Wednesday 12:15–12:45 Location: H8

DS 34.1 Wed 12:15 H8

Quartz Crystal Microbalance Studies of the First Few ALD Cycles of Alternated Grown Titania and Alumina Layers — •Robert Zierold[1], René Faust[1], Christoph Wiegand[1], Martin Waleczek[1], Robert H. Blick[1], and Kornelius Nielsch[1,2] — [1]Institute of Nanostructure and Solid State Physics, Universität Hamburg, Hamburg, Germany — [2]Institute for Metallic Materials, Leibniz Institute for Solid State and Materials Research Dresden, Dresden, Germany

Atomic layer deposition (ALD) in a supercyclic fashion is a common approach to synthesize tailor-made ternary materials, to prepare nanolaminates, or to distribute a doping species in a host material. However, assuming the growth rates of the two underlying individual ALD processes to calculate the overall thickness or the composition of the ternary material often results in a deviation to the experimentally observed values.

Herein, we present detailed, ultra precise quartz crystal microbalance (QCM) studies of the first few ALD cycles of TiO_2 deposited on an Al_2O_3 surface grown by ALD , and vice versa. A significantly altered initial growth per cycle (GPC) compared to the equilibrium (literature) value is observed. In detail, the growth of TiO_2 on Al_2O_3 is enhanced whereas the growth of Al_2O_3 on TiO_2 is reduced: In both cases, the initial GPC of the deposited oxide matches the ALD growth rate of the substrate material. Our observation can be explained by an intrinsic growth inhibition caused by the less reactive, sticking isopropyl groups occurring in the TiO_2 deposition process.

DS 34.2 Wed 12:30 H8

Frontiers of Thin-Film Deposition: MAD-ALE growth and optical properties of Ruddlesden-Popper $SrO(SrTiO_3)_n$ phase — •Fryderyk Lyzwa[1], Premysl Marsik[2], Vladimir Roddatis[1], Markus Jungbauer[1], Christian Bernhard[2], and Vasily Moshnyaga[1] — [1]Georg-August-Universität Göttingen, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany — [2]Université de Fribourg, Département de Physique Chemin du Musée 3, 1700 Fribourg, Switzerland

As an unconventional method to deposit oxide films, Metalorganic Aerosol Deposition (MAD) shows an immense growth control up to submonolayer basis. The possiblities of MAD are presented by complex Ruddlesden-Popper (RP) n=4 films with the general formula $SrO(SrTiO_3)_n$ in which perovskite layers of $(SrTiO_3)_n$ are separated by single SrO layers. Those dielectrics are promising due to low-loss for microwave frequencies and could replace the well-studied system of $BaSrTiO_3$.

The films were grown in atomic layer epitaxy (ALE) mode by sequential deposition of Sr-O/Ti-O_2 atomic layers, monitored by optical in-situ ellipsometry, on SrTiO3(100) (unstrained), on LSAT(100) and on $DyScO_3$(110). The RP structure was confirmed by x-ray diffraction and transmission electron microscopy. A 10nm-thick buffer enables an additional control nearby the substrate surface; it reduces significally the film roughness. Further we measured the infrared active phonon modes as a function of temperatureto in order to study the structure.