

Contribution submission to the conference Regensburg 2019

Depth profiling of PEALD-AlN films based on Al2p XPS peak decomposition — •ALI MAHMOODINEZHAD^{1,2}, EMILIA POZAROWSKA¹, KARSTEN HENKEL^{1,2}, DIETER SCHMEISSER¹, and JAN INGO FLEGE² — ¹Applied Physics and Sensor Technology, BTU Cottbus-Senftenberg — ²Applied Physics and Semiconductor Spectroscopy, BTU Cottbus-Senftenberg

AlN has remarkable properties (wide band gap, low electrical and thermal conductivity, high dielectric constant, piezoelectricity) and is attractive for (opto)electronic and sensor applications. However, high oxygen content within nitride films is always a critical issue due to the thermodynamically favorable oxidation against nitridation resulting in deteriorated materials properties. In order to clarify whether the oxidation is a surface-limited or a bulk process elemental depth profiling is essential. In this work XPS in combination with Ar⁺ sputtering is applied to carry out depth profiling of AlN films prepared by plasma-enhanced atomic layer deposition using different parameters (plasma source, power and pulse duration). Particularly, the Al2p core levels are analyzed where the signals are decomposed into four components, representing weaker contributions of pure AlN and aluminum oxide phases as well as stronger signals of mixed oxygen-rich and nitrogen-rich phases. After sputtering (providing access to the deeper part of the film) the pure AlN phase content increases while the pure aluminum oxide content stays relatively constant. These issues are discussed with regard to the preparation parameters employed and accompanying XRD and electrical measurements.

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