In-situ real-time and ex-situ spectroscopic analysis of Al_2O_3 films prepared by plasma enhanced atomic layer deposition

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The SENTECH Real-Time-Monitor (RTM) with its very high time resolution is well suited for the in-operando investigation of atomic layer deposition (ALD) processes. In the present work RTM was used to monitor the inductively coupled plasma-enhanced (ICPE) ALD process of Al_2O_3 thin films. Thereby each step of the ALD process was precisely resolved with 24 ms time resolution. In combination with ex-situ ellipsometry and X-ray photoelectron spectroscopy, the influences of plasma power, plasma pulse duration, and deposition temperature on the film quality were investigated. Al_2O_3 films deposited by thermal ALD (T-ALD) utilizing the same reactor were used as a benchmark.
The optical properties of ICPEALD deposited Al_2O_3 films are comparable with those of T-ALD films. However, depending on the used plasma pulse duration and power, additional adsorption processes are observed. The RTM was used to identify and minimize this unintentional adsorption, resulting in high quality Al_2O_3 films. [1]

[1] F. Naumann, *J. Vac. Sci. Technol. B,* 38(1), **2020**