

Workshop »Coatings for Optics and Optical Components«

Spatial plasma-enhanced Atomic Layer Deposition for optical applications

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Atomic Layer Deposition (ALD) is a thin-film coating technique well-suited for dense and high quality 3D-conformal coatings on optical components. The method is based on sequential, saturative chemical surface reactions and may be time-consuming for thick coatings due to low growth rates. As some optical coatings & designs can require a thickness of multiple micrometres, often another method is used for the deposition. This limitation can however be overcome either by large batch sizes or by utilizing spatial ALD technique. In spatial ALD, objects to be coated are physically moved between sequential chemical precursor exposures. With suitable choices of precursors and reactor design, rates of 20-fold improvements in film growth rates (nm/h) can be reached.

We present recent results for optical coatings from a spatial ALD tool, the Beneq C2R (Figure 1), which is a rotary-type spatial ALD tool that utilizes plasma as one of the reactants. The tool is designed primarily for use in optical applications and we also explore the general possibilities and applications of the ALD method for optical coatings with some unique aspects such as gradient-index layers (Figure 2).



Figure 1: Beneq C2R spatial ALD tool.

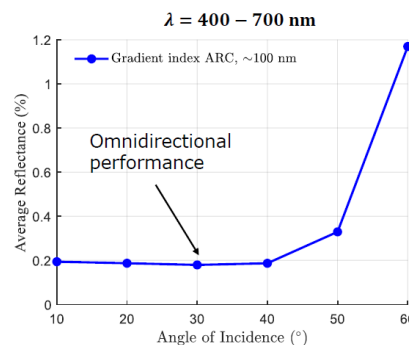


Figure 2: Reflectance of an anti-reflective coating by ALD based on gradient-index layer(s).