

Workshop »Coatings for Optics and Optical Components«

Augmented reality displays - a new challenge for large area precision coatings

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Large area precision coatings are a key enabler for new types of augmented reality displays. Two examples are presented in detail both of which were developed in cooperation with SeeReal Technologies. First, is a backlight for a holographic display, that is needed to expand RGB laser light to the display size. This requires optical filters with the size of the display with error tolerances of only $\pm 0.5\%$. Second is an optical coating on a car windshield needed for a holographic HUD system.

Magnetron sputtering is commonly used for the fabrication of precision optical coatings especially on small substrates. Turntable or drum coating systems are mostly used, which allow layer formation in meta mode process. However, these process cannot be scaled substrates sizes larger than approximately 300 mm.

Inline magnetron sputtering is used to deposit layer systems on large flat glass substrates with coating widths of up to 3 meters. Dedicated components also enable good layer properties with such concepts making the process suitable for the fabrication of precision optical filters: low absorption, low scattering, low layer roughness, low mechanical stress, and low particle contamination [1]. The process is even suitable for the deposition of laser mirrors.

This paper reports on the transfer of these concepts to demonstrate high-performance display-sized optical filters and optical performance on large size curved substrates such as windshields. Rotatable as well as planar magnetrons, in situ trim shields and an in situ spectrometric thickness monitor have been used to ensure process stability and reproducibility. The Fraunhofer FEPs precision coating development platform "PreSensLine" will be introduced offering the capability to transfer the processes of typical throughput-limited optical coating systems operating in batch mode to dynamic coating and thus to large-area substrates.

[1] Daniel Gloess, Ullrich Hartung, Andy Drescher, Peter Frach, Hagen Bartzsch, "Freeform and Laser Optical Coatings by Inline Magnetron Sputtering", Proceedings of Optical Interference Coatings Conference OIC 2019.