Enhanced Optical Sputtering Systems for the Precision Optics

The manufacture of multilayer optical precision coatings requires films with very good and constant uniformity, precise and stable optical constants, virtually no optical shift caused by porosity, low defect contamination and no losses. Basically, the ever increasing demands on individual optical interference coatings of high quality are an ongoing challenge. During the last years older evaporation machines are replaced by new equipment since the complexity of the specifications increases. Also the market of interference coatings is widening driven by the increasing use of laser equipment in many applications from material processing to analytics. These demands can be addressed by magnetron sputtering because of high layer quality and large throughput of the machines.

Highly sophisticated optical coatings with extremely low level of defects

Thin films will be prepared by metallic mode sputtering with layer uniformities of better than 0.25%. These uniformities will be realized for multilayer stacks usually ranging from 50 to a few 100 layers with a typical overall stack thickness of typically 5–30 μm while scattering and absorption keep at very low values. A bright variety of low- and high-index materials is available as cylindrical target material, e.g. for interference coatings based on SiO₂, Nb₂O₅ and Ta₂O₅. The coating process is optically monitored.

Multi notch filters, narrows-bandpass filters, step edge filters and laser mirrors

In today’s sputtering solutions in the field of precision optics, usually planar targets are used which suffer from inhomogeneous surface erosion. This leads to a drift in uniformity over time, higher material costs and in the case of reactive sputtering an increased tendency to form arcs which cause particle generation. The magnetron sputtering systems FHR.Star.500-EOSS® and FHR.Star.600-EOSS® overcome the disadvantages planar magnetrons present to sputtering. The rotating turntable coaters are equipped with dual cylindrical magnetrons in a sputter-up configuration.

The turntable can hold up to 12 carriers per batch. Supporting carrier sizes are 314 cm² (FHR.Star.500-EOSS®) and 924 cm² (FHR.Star.600-EOSS®) and the maximum substrate thickness is 50 mm (planes, prisms, lenses). Substrate carriers are handled automatically from a magazine load lock. A recipe program generator and the fully automated process control satisfy customer demands for highest accuracy, productivity, process stability and reproducibility.