The black curve shows the initial distribution. After ten weeks the red distribution emerged. Then the sputter compartment was opened, cleaned and a number of components replaced at the same time. Following a short period of running-in, the violet distribution was measured, which corresponds almost exactly to the initial distribution.

Example: production of optical filters
Long-term stability was evident not only in the creation of individual layers but also in the production of filters. The plate-to-plate distribution is also always relevant here. The second graph shows the homogeneity of the layers after ten weeks of operation with a fully populated batch with ten substrates – nine carriers and one monitoring system. In the graph the normalized position of the band edge is plotted on the y axis while the distribution on the longitudinal and transverse axes was measured relative to the movement. The shape of the curves shows clearly that the distribution is excellent even with a full batch with ten substrates each with a diameter of 200 mm.

EOSS® coating concept
In the production of optical coatings the Fraunhofer IST relies on using magnetron sputtering technology. With the EOSS® platform an approach has been selected in which a batch of ten substrates each with a diameter of 200 mm is arranged on a turntable which rotates continuously at a fast speed. Using cylindrical magnetron sources rather than planar magnetrons yields decisive advantages, since the layer thickness distribution is extremely stable in the long term. The advantage is obvious: readjustments, batch planning or other measures are no longer necessary. In the case of the sputtering cathodes, sub-stoichiometric oxides among other things are used as targets. Previous research showed that this leads to improved values for the layer thickness distribution and that conditioning can be simplified significantly. Current measurements at the Fraunhofer IST show that absorption is even improved in the case of Ta2O5 as a high-index material.

The graph shows the results of a long-term investigation of layer thickness distribution. During the course of our work more than 70 layers of µm thickness (here SiO2) have been deposited in different coating runs. The black curve shows the initial distribution. After ten weeks the red distribution emerged. Then the sputter compartment was opened, cleaned and a number of components replaced at the same time. Following a short period of running-in, the violet distribution was measured, which corresponds almost exactly to the initial distribution.
The examples illustrate how with EOSS® technology new and extremely sophisticated optical coatings can be manufactured on the industrial scale with a high level of process reliability.

1. The EOSS® coating platform at the Fraunhofer IST.

2. The optical broadband monitoring system MOCCA®+ from the outside.

3. View of the monitor plate, a component of the MOCCA®+ monitoring system.

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