measurement report

S2(^): batch C217H023
PR(0°,1010-1050nm)=99.0(±0.5)% (High power für ps Pulse)

S1: batch C217H031
AR(0°,1010-1070nm)<0.2%

Determination of reflectivity (R) by transmission measurements

Optical properties of sputtered dielectric coatings

Sputtered optical coatings for the VIS and NIR exhibit extremely low scattered light and absorption losses (both in the order of some 10^{-5}... 10^{-4}). This has been confirmed by direct measurements of scattered light and absorption as well as by highly accurate reflectivity measurements (e.g. by cavity ring down spectroscopy). Knowing these very small optical losses, the reflectivity of sputtered mirrors can be determined by measuring the transmission T and the simple calculation R=100% - T - A

Transmission measurement vs. reflectivity measurement of optical coatings using spectrophotometry

In a normal spectrophotometer, the transmission can be measured with an accuracy of about 0.1...0.2% (depending on the absolute value), whereas reflectivity measurements in spectrophotometers mostly have errors of about 0.5%. Thus, the determination of the reflectivity of sputtered coatings in the VIS and NIR by transmission measurements is much more accurate than direct reflectivity measurements.

Procedure of indirect determination of the reflectivity for any given AOI by transmission measurements at AOI=0°

AOI (angle of incidence = angle between the incident beam and the surface normal of the substrate).

As explained above it is possible to determine the reflectivity on the base of transmission measurements at AOI=0°. The procedure is the following:

First the transmission at 0° incidence angle is measured (dashed line in fig.1). Computer algorithms recalculate the theoretical design to adapt to the measured spectrum until the theoretical transmission (continuous line in fig.1) matches as good as possible to the measured spectral data.

Hence all errors which may occur during the coating process (e.g. slight deviation of the sputter rate with growing number of layers, rising substrate temperature etc.) can be taken into account.

This procedure provides the real design of the coating enabling us to estimate many optical properties.

This method proved to be very accurate.

fig. 1:
transmission measurement 0° (- - - - -)
refined theoretical design 0° (_____)

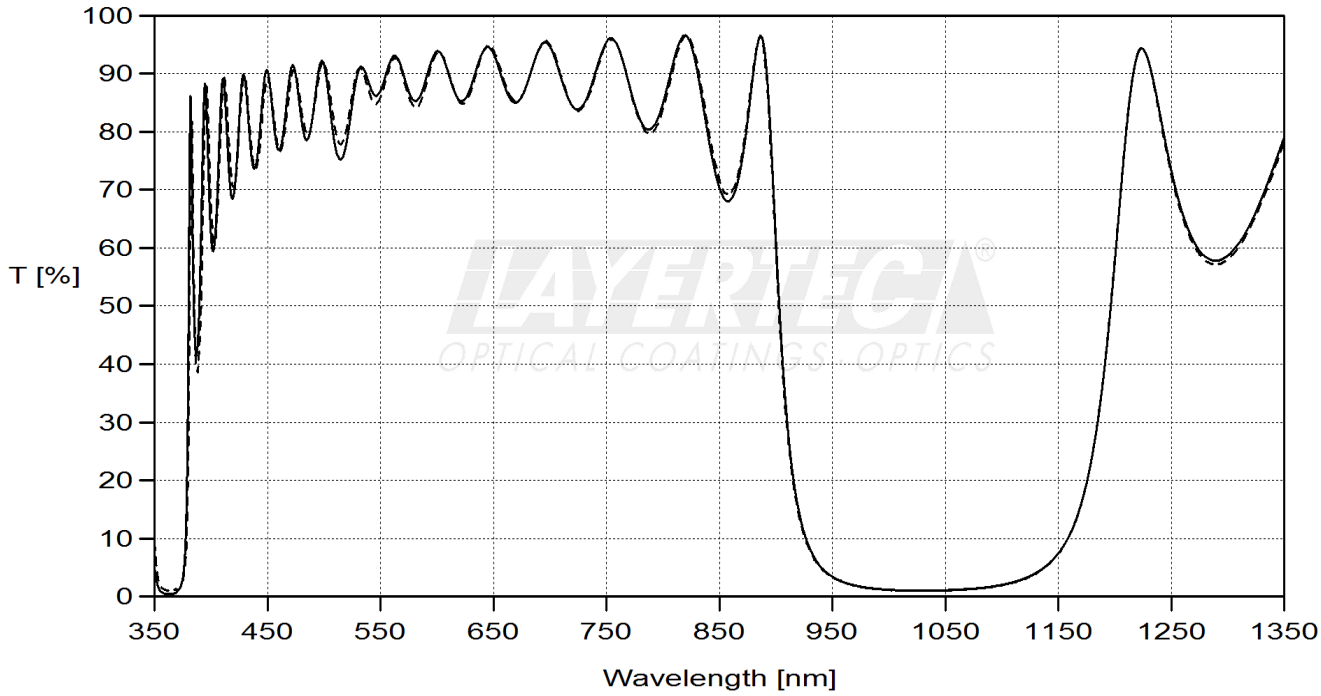

fig. 2:
calculated reflection of S2 at 0° (based on refined th. design fig. 1)

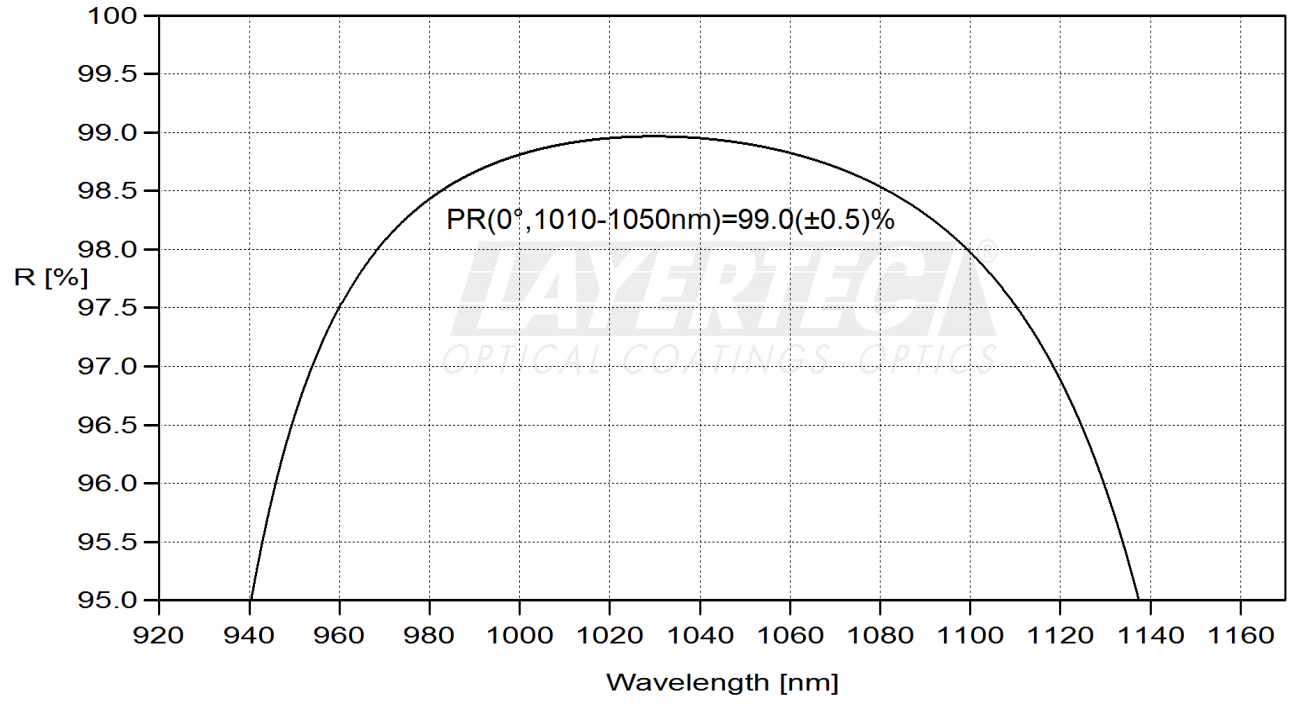

fig. 3:
calculated rear side AR at 0°