Method to directly obtain the extinction coefficient of small absorption materials

CSIC has developed a method to directly obtain the extinction coefficient of small-absorption materials from a single measurement of transmittance difference. Such measurement is performed on a sample that is coated with two different film thicknesses of the target material in two areas. The disclosed method is particularly suitable to measure small extinction coefficients, which cannot be accurately measured with standard spectrophotometers and ellipsometers.

Industrial partners from the optical metrology industry are being sought to collaborate through a patent licence agreement.

An offer for Patent Licensing

The extinction coefficient (k) of a material is a fundamental parameter that must be known to design all sorts of optical coatings. Transmittance of small-absorption films, the most suitable for optical coatings, is close to 100%, from which it is difficult to obtain a meaningful value of k of the material with present spectrophotometers.

The present invention provides a direct measurement of k through the oscillation of the sample with respect to the light beam or vice versa. k is proportional to the transmittance difference over two sample areas with different film thicknesses or with one film in one area while the other area remains uncoated. Such transmittance difference is directly provided by a lock-in amplifier. Measurements must be performed at a specific angle of incidence and light polarization.

The present invention could be included in a modified spectrophotometer that enables relative oscillation of light beam and sample.

Main innovations and advantages

- The method enables direct measurement of the extinction coefficient (k) of a material deposited as a film
- The method is more beneficial to measure materials with small absorption. In this case, it is difficult to obtain k from standard spectrophotometer or ellipsometer measurements
- The method provides the derivative of the transmittance with respect to film thickness, which is an additional function that can be used to calculate both k and the refractive index of the material.