

# Nanooptics and photonics

## Registration amplitude and phase anisotropy of Zeolite layers on different substrates by modulation polarimetry for sensors application

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Zeolites possess regular porous structures, high surface areas, shape-selectivity, and unique solid acidity, having extensive applications in catalysis, ionic exchange, separation, and adsorption. Thin layers of Zeolite 3A have been deposited by a technique of low-temperature spin coating process proposed by Fiorillo et al. [1]. Unique properties of Zeolite, sensitivity of the modulation polarimetry [2] combine with plasmonic are perspective for optical biosensor systems.

The aim of this work is to study the amplitude and phase anisotropy of the Zeolite 3A layers deposited on substrates with different materials, using modulation polarimetry parameters such as a polarization difference and V-component of the Stokes vector parameters.

Zeolite layers (10  $\mu\text{m}$  thickness) deposited onto dielectric and conductive substrates such as glass, gold and ITO (Indium Tin Oxide) were investigated. UV-VIS spectroscopy and modulation polarimetry in Kretschmann geometry were carried out in order to characterize optical polarization properties of these structures. Angular and spectral dependencies of the polarization difference  $\rho(\lambda, \theta)$  and V-component of Stokes vector in the wavelength range  $\lambda = 0.4\text{--}1 \mu\text{m}$  were measured. Very small values of the experimental parameters of the polarization difference and V-component were observed for the Zeolite layer on glass substrate. The possibility of increasing the response of the Zeolite layer by using gold and ITO substrates was shown. Our studies have shown that the type of substrate materials have a significant influence on the optical polarization response of Zeolite in Kretschmann geometry, which is important for sensor applications.

These results underlie more comprehensive research of Zeolite properties with the help of full Stokes analysis for design of low-cost gas sensors systems based on modulation polarimetry.

- [1] A.S. Fiorillo, R. Tiriolo, S.A. Pullano, "Absorption of Urea into zeolite layer integrated with microelectronic circuits", *IEEE Transactions on Nanotechnology.*, vol. 14, n. 2, 2015.
- [2] A.S. Fiorillo, S.P. Rudenko, M.O. Stetsenko, et al., "Optical Polarization Properties of Zeolite Thin Films: Aspects for Medical Applications", *IEEE International Symposium on Medical Measurements and Applications Benevento, Italy*, pp.332-335, May 15-18, 2016.