Nanoplasmonics and surface enhanced spectroscopy

Zeolite Thin Films – current state and feature trends

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Zeolite are nanoporous, crystalline aluminosilicate, which possess an excellent mechanical properties, ion-exchange and molecule-trapping capabilities. A precise uniform pore size and molecular dimension makes zeolites an excellent molecular sieve. Using technique that proposed by Fiorillo et al. [1] the thin layers of Zeolite 3A with porosity of 3 Å were deposited on a silicon wafer by low temperature spin coating process.

Optical polarization properties of the zeolite films with different thickness of 10, 50 and 100 μm have been studied by the modulation-polarization spectroscopy technique [2], which is recently an effective to investigate of porous nanostructures. Angular and spectral dependencies of polarization difference (λ, θ) of reflection coefficients of *s*- and *p*-polarized radiation in the wavelength range λ = 0.4–1 μm were measured. It was found that ability about 1% reflection of light make the zeolite films perspective as the anti-reflective coating on devices due to its low-dielectric properties that important for solar applications. It was confirmed by theoretical evaluations. The internal porous morphology of zeolite films was demonstrated by MPS and SEM measurements. Porous spaces within the zeolite can also serve as a host for guest species. Thickness reduction of the zeolite films leads to increase of reflectivity, which allows improving the sensitivity in registering of small changing medium. Creation of plasmonic sensor chips based on the zeolite film with incorporating metal nanoparticles for registration effect molecular binding is perspective. As a result, change of optical polarization properties due to presence of any guest species upon interaction with medium can be perspective for using in sensors applications.

1. *Fiorillo A.S., Tiriolo R., Pullano S.A.* Absorption of Urea into zeolite layer integrated with microelectronic circuits // IEEE Transactions on Nanotechnology.-2015.-**14**.-P. 214-217.
2. *Stetsenko M.O., Maksimenko L.S., Krishchenko I.M., Korchovyi A.A., Kryvyi S.B., Kaganovich E.B., Serdega B.K.* Surface Plasmon's Dispersion Properties of Porous Gold Films // Nanoscale Research Letters.-2016.-**11**, N.1.