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Optimizing plasmonic properties of supported silver nanocube monolayers[1] ANATOLI IANOUL, ADAM BOTTOMLEY, NUR AHAMAD, Carleton University — The refractive index (RI) sensitivity of extinction spectra was compared experimentally for silver nanocubes in solution and in supported monolayers prepared by the Langmuir technique. The size of the nanocubes, RI of supporting dielectric substrate, and the monolayer surface pressure were used as variables in refractive index sensing (RIS) optimization. The dipolar plasmon modes of the colloidal nanocubes were found to have the highest RIS values of 176, 361 and 480 nm/RI units for 40, 80, and 130 nm cubes respectively. The largest figure of merit (FOM) of 4.55 was measured for a quadrupolar mode of 130 nm nanocubes. When compared to suspensions, RIS of supported nanocubes were reduced by $\sim$50% and decreased with increasing monolayer surface pressure. RIS of 40 nm cube monolayers appeared to be sensitive to the substrate RI due to the RI dependent plasmon mode hybridization resulting in dipolar (D) and quadrupolar (Q) modes. RIS sensitivities of D and Q modes for silicon- supported nanocube monolayer were found to be 78 and 170 nm/RI units respectively. The FOM for the Q mode appeared to be 5.5. Intensity of this Q peak was found to increase with the angle of incident light. This work shows the use of high refractive index dielectric substrates, a passive molecular spacer, and large angles of incidence can significantly improve the detection of plasmonic response by supported nanocube monolayers.

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