Mechanotunable Surface Lattice Resonances in the Visible Optical Range by Soft Lithography Templates and Directed Self-Assembly.

Vaibhav Gupta[1], Patrick T. Probst[2], Tobias A. F. König[3]

[1] *Leibniz-Institut für Polymerforschung Dresden e. V., Hohe Straße 6, D-01069 Dresden, Germany*

[2] *Cluster of Excellence Centre for Advancing Electronics Dresden, Technische Universität Dresden, Mommsenstraße 4, D-01062 Dresden, Germany*

We demonstrate a novel approach towards mechanically tunable, cost-efficient and low-loss plasmonic nanostructures, whose pronounced optical anisotropy upon mechanical deformation can be detected by naked eye. Soft interference lithography and template-assisted colloidal self-assembly are used to fabricate a stretchable macroscopic periodic square lattice of gold nanoparticles. Surface scanning methods reveal a full coverage of the array. The high structural quality results in a narrow bandwidth surface lattice resonance with a line width of 25. Stretching of the system results in reversible transition from the square lattice to a rectangular symmetry and corresponds to pronounced changes in the optical properties of the ensemble. We show the hybrid nature of the optical response using angle dependent UV-vis spectroscopy and numerical simulations. Based on these findings we discuss potential applications as strain sensor and mechanically tuneable filters.

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