



Meta-atom Sensitivity Analysis of a Partially Embedded Plasmonic Disordered Metasurface for Biosensing Applications

Disordered metasurfaces of plasmonic nanospheres have emerged as an alternative to ordered systems due to their scalability and ease of fabrication. For instance, thermal dewetting enables the large-area production of nanosphere ensembles exhibiting broad size distributions, random spatial arrangements, and partial embedding into the substrate. In this work, the sensitivity to local refractive index changes of a single partially embedded nanosphere is evaluated through Finite Element Method simulations employing an embedding parameter determined with a non-destructive approach based on a multiple scattering theory, accounting the morphological features of synthesized metasurfaces, fitted to experimental extinction spectra. The results provide insight into how realistic fabrication conditions impact the optical response and sensing performance of disordered plasmonic metasurfaces.