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# Localized surface plasmons in a shell and hollow circular nanodisk

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**Abstract**
In this study, the excitation of localized surface plasmons in a shell and hollow circular nanodisk was theoretically simulated using the Finite Difference Time Domain (FDTD) method. The effects of shell and cavity sizes on the localized plasmonic modes were analyzed. The localized plasmonic modes were extracted from the extinction spectra, and their electric field distributions and charge densities were investigated as a function of structural parameters. The results indicated that by examining asymmetric nanoparticles, where the shell size differs on each side due to the varying location of the cavity, and by studying nanoparticles with multiple cavities, more diverse plasmonic modes could be achieved. The occurrence of such diverse modes in shell-and-hollow nanodisks could have broad applications in quantum photonics, plasmonic sensors, information processing, and photothermal therapy.

**Keywords:** localized surface plasmons, shell nanoparticles, asymmetric shell, multicavity nanoparticles

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