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Boosting Chirality and Strong Coupling with Bound States in the Continuum in Plasmonic Metasurfaces

We demonstrate that bound states in the continuum (BICs) can arise in plasmonic metasurfaces and enable a strong chiral optical response. The metasurface consists of a gold film on glass patterned with a square lattice of nanoholes whose shapes are deformed from circular to oval. Symmetry breaking induces a quasi-BIC in the absorption spectrum on the low-energy side of the surface-plasmon-polariton resonance. At finite incidence angles along the x direction, this mode exhibits a strongly chiral response with nearly maximal circular dichroism (CD). Notably, the maximum CD is nearly independent of the deformation, indicating robust chiroptical behavior against structural variations. Furthermore, we predict a chiral optical response in the strong-coupling regime, achieved by coupling the plasmonic quasi-BIC to an active medium modeled by a tunable Lorentz oscillator strength.

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