What is a good material for plasmonic metamaterials?

Scientific Achievement

Developed a model and figures-of-merit for control of light with surface wave based resonant metamaterials and universally quantify the trade-off between loss & confinement

Significance and Impact

Our model and survey of materials allows scientist to understand optical losses & chose or design better materials for plasmonics

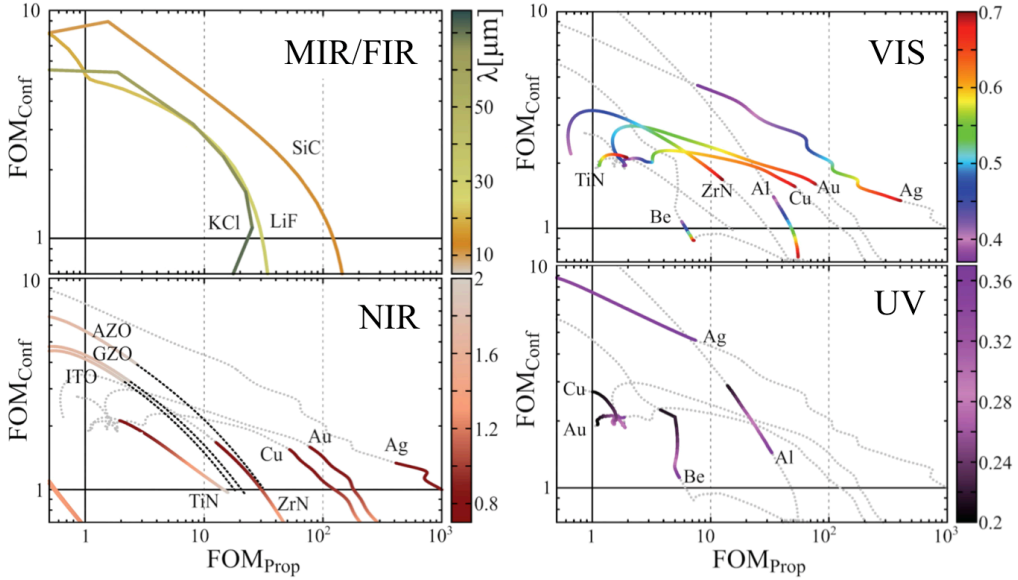

Figure-of-merit (FOM) diagram of surface phonon polaritons at mid-/far-infrared, and surface plasmon polaritons at near-infrared, visible, and ultraviolet wavelengths for experimental data. Color represents wavelength (μm); dotted lines are continuations outside the designated wavelength range, dashed lines extrapolations for transparent conducting oxides in NIR from 2 to 5μm.

Research Details

Resonant metasurfaces based on localized surface modes have revolutionized our control of light-matter interactions at optical frequencies. Trade-offs are necessary between loss and confinement in realistic structures and behave universally. Specific materials are appropriate only for small spectral domain and must be chosen carefully.

Babak Dastmalchi, Philippe Tassin, Thomas Koschny, and Costas M. Soukoulis, "A New Perspective on Plasmonics: Confinement and Propagation Length of Surface Plasmons for Different Materials and Geometries," Adv. Optical Mater. 4, 177-184 (2016). DOI: 10.1002/adom.201500446.