Femtosecond Light Transmission and Subradiant Damping in Plasmonic Crystal

They report the first observation of subradiance in plasmonic nanocrystals. Amplitude- and phaseresolved ultrafast transmission experiments directly reveal the coherent coupling between surface plasmon polaritons (SPPs) induced by periodic variations in the dielectric function. This interaction results in the formation of plasmonic band gaps and coupled SPP eigenmodes with different symmetries, as directly shown by near-field imaging. In antisymmetric modes, radiative SPP damping is strongly suppressed, increasing the SPP lifetime from 30 fs to more than 200 fs. The findings are analyzed within a coupled resonance model.

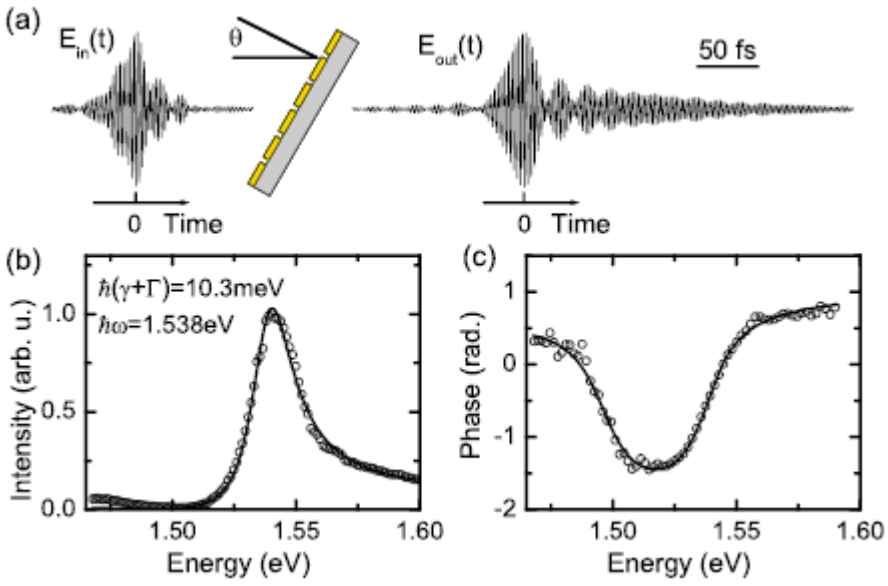

FIG. 1 (color online). (a) Time structure of the electric field Ein(t) of the incident 11 fs pulses and of the pulses Eout(t) transmitted through a nanoslit array with a0=650 nm at an angle θ of 8°. (b) Representative transmission spectrum $T(\omega)=\left|Eout(\omega)/Ein(\omega)\right|^2$ and (c) spectral phase φ(ω)=arg[Eout(ω)/Ein(ω)] (open circles) near the SM[_ 2]

resonance. Solid lines: Fit to Eq. (1) with parameters indicated in (b).

For more information: https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.94.113901