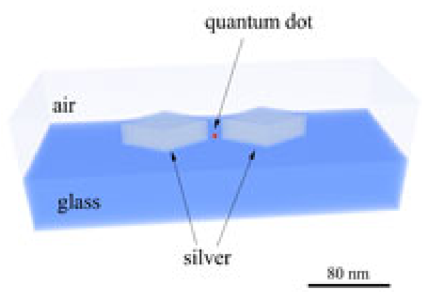
In Brief: Quantum dot-Induced transparency

December 1 2010

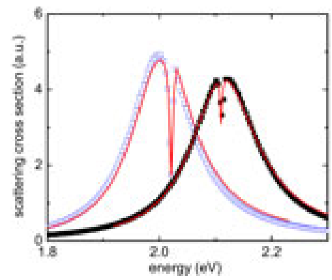


A quantum-dot/metal nanoparticle hybrid structure that could be fabricated lithographically.

Using rigorous and realistic numerical simulations, staff in the Nanophotonics and Theory and Modeling groups at the Argonne National Laboratory have recently demonstrated that a single semiconductor nanocrystal, or quantum dot, can cancel the scattering and absorption by a much larger metal nanostructure.

Placing a quantum dot near a metal is known to strongly modify the rate at which the dot emits light.

If the interaction between the dot and the metal is strong enough, scattering and absorption by the metal can be nearly eliminated at the quantum-dot resonance frequency, according to the simulations.



Scattering spectra for the structure when the corners of the metal nanoparticles have a curvature of 5 nm (solid squares) and 2 nm (open squares), calculated using the FDTD method. The lines are fits to a coupled-oscillator model.

This occurs even though the dot by itself simply absorbs light, and even though this absorption is nearly 100,000 times smaller than absorption by the metal nanostructure.

More information: X. Wu, S. Gray, and M. Pelton, “Quantum-dot-induced transparency in a nanoscale plasmonic resonator,” *Opt. Express*., 18, 23633-23645 (2010).

Provided by Argonne National Laboratory

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