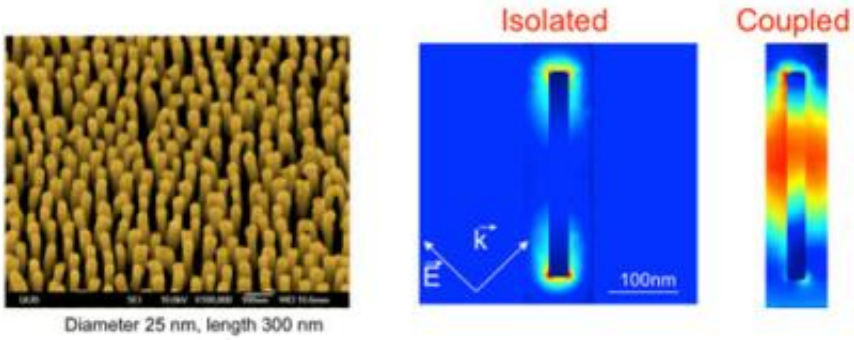
In Brief: Ultrafast transparency in a plasmonic nanorod

January 25 2011



The plasmonic gold nanorod material is shown on the left, and modeling of the isolated and coupled plasmonic field is shown on the right. The delocalized nature of the plasmonic field is evident.

Users from the University of North Florida and King's College London collaborated with Argonne scientists in the Nanophotonics Group to show that closely spaced plasmonic gold nanorods produce an ultrafast transmission change when illuminated with a low-energy optical pulse.

The ultrafast switching behavior is due to strong coupling between the nanorod plasmons, which are collective free-electron responses of metals that are driven by the incident light.

The key discovery is that the closely spaced nanorod material exhibits nonlocality of the optical response, which has an unusually strong

nonlinear dependence on incident light intensity.

These materials belong to a new class of “metamaterials” – those with optical properties and responses that do not occur naturally.

Electromagnetic modeling by Univversity of Massachusetts collaborators confirms the nonlocal response of the plasmonic metamaterial.

More information: G. A. Wurtz et al., *Nature Nanotechnology*, in press (2011).

Provided by Argonne National Laboratory