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**Plasmonic properties of a nanosized hole in a thin metallic film**

TAE-HO PARK, PETER NORDLANDER, Department of Physics, Rice Univ. —  
We investigate the optical properties of a nanosize hole in a thin metallic film. We show that the optical absorption spectrum is characterized by a plasmon resonance of an energy that depends strongly on the ratio of the hole diameter and the film thickness in qualitative agreement with experimental results. Microscopically, the nanohole plasmon is shown to consist of a collective state formed by propagating thin film plasmons. The hole surface exposes the film plasmons and introduce a dipole moment which allows the coupling to incident light. We also show that the energy of the hole plasmon resonance depends strongly on the polarization and direction of the incident light.

Tae-Ho Park  
Department of Physics, Rice Univ.

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