

INVITED: Eigen Mode Analysis of Plasmon Resonances in Nanoparticles

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A novel eigen mode approach to the analysis of plasmon resonances in nanoparticles will be presented. In this approach, the physical phenomenon of plasmon resonances is framed as an eigenvalue problem for specific boundary integral equations. The time-dynamics of excitation and dephasing of plasmon modes as well as their coupling to incident radiation will be discussed in detail. Explicit formulas for steady-state amplitudes of plasmon modes for resonance and off-resonance excitations will be given. These formulas reveal the sharpness (line-width) of plasmon resonances. Optical controllability (gating) of plasmon resonances in semiconductor nanoparticles will be outlined along with their possible application to the development of all-optical nanotransistors. Other applications of plasmon resonances such as SERS and all-optical magnetization switching will be reviewed as well.