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Surface plasmon lifetime in metal nanoshells[1] A.S. KIRAKOSYAN, T.V. SHAHBAZYAN, Jackson State University — Lifetime of localized surface Plasmon in metal nanostructures plays important role in many aspects of plasmonics and its applications. In small nanometer-sized spherical particles, the dominant mechanism is size-dependent Landau damping that limits plasmon lifetime to $t<R/v$, where R is nanoparticle radius and v is the electron Fermi velocity. It has long been expected that for other nanostructures, the plasmon lifetime should be similarly determined by their characteristic size. We performed quantum-mechanical calculations of Landau damping in metal nanoshells with dielectric core, and found a significant difference of plasmon lifetime from the expected behavior. In particular, due to electron scattering on two metal surfaces, the damping rate exhibits pronounced quantum oscillations with changing shell thickness. Our calculations explain the results of recent measurements of plasmon lifetime in gold nanoshells.

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