Nanoplasmonics and surface enhanced spectroscopy

Sensing the temperature influence on plasmonic field of metal nanoparticles by photoluminescence of fullerene C_{60} in layered C_{60}/Au system

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Influence of temperature on the plasmonic field in the temperature range of 78–278 K was studied employing surface plasmon enhanced photoluminescence from the fullerene C_{60} thin film deposited on 2D array of Au nanoparticles. It was experimentally found that temperature dependence of plasmonic enhancement factor of C_{60} luminescence decreases monotonically with the temperature increase. Influence of temperature on plasmonic enhancement factor was found to be considerably stronger when the frequency of surface plasmon absorption band of Au nanoparticles and the frequency of fullerene luminescence band are in resonance. Electron-phonon scattering and thermal expansion of Au nanoparticles were considered as two competing physical mechanisms of the temperature dependence of plasmonic field magnitude. The calculations revealed significant prevalence of the electron-phonon scattering. The temperature induced increase in the scattering rate leads to higher plasmon damping that causes the decrease in the magnitude of plasmonic field.