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Interplay between dynamics of molecule and surface plasmons in scanning tunneling microscope-induced light emission KUNIYUKI MIWA, MAMORU SAKAUE, HIDEAKI KASAI, Department of Applied Physics, Osaka University, Japan — Scanning tunneling microscope (STM)-induced light emission spectroscopy of molecules has unique advantage to investigate the luminescence properties of molecules with the atomic-scale spatial resolution. Recently, many attempts have been made to control the molecular luminescence by using the intense electromagnetic field generated by surface plasmons localized near the tip-substrate gap region. In this study, the nonequilibrium Green's function method are utilized to investigate effects of coupling between an exciton composed by electron and hole in the molecule and the surface plasmons on the luminescence properties of the molecule and the surface plasmons. It is found that the luminescence intensities of the molecule are suppressed due to the re-absorption of the surface plasmons by the molecule. Molecular absorption and enhancement by molecular electronic and vibrational modes lead to dip and peak structures in the luminescence spectra of the surface plasmons. Corresponding structures can be seen in a recent experiment. Moreover we found that the re-absorption by the surface plasmons plays important roles in determining the luminescence spectral profiles. We will discuss the detailed mechanisms of variation in these luminescence spectral profiles.

Kuniyuki Miwa
Department of Applied Physics, Osaka University, Japan

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