Abstract Submitted for the MAR14 Meeting of The American Physical Society

Quantum Many-Body Dynamics in Luminescence from Molecular Exciton and Plasmon Induced by Scanning Tunneling Microscopy KUNIYUKI MIWA, MAMORU SAKAUE, Department of Applied Physics, Osaka University, BRANKO GUMHALTER, Institute of Physics, HIDEAKI KASAI, Department of Applied Physics, Osaka University, Center for Atomic and Molecular Technologies, Osaka University — In scanning-tunneling-microscope (STM)-induced light emission (STM-LE) from clean and molecule-covered metal surfaces, surface plasmons localized near the tip-substrate gap region play important roles in electronic excitations and radiative decays of molecules. A recent experiment succeeded to observe that the dynamics of the molecule (e.g., luminescence and energy absorption) have an influence on the luminescence spectral profiles of surface plasmons. To understand this from a microscopic point of view, there is a need to investigate the dynamics of the molecule and surface plasmons within the framework of quantum many-body theory. In this study, we construct the effective model of the system and investigate the effects of coupling between a molecular exciton and a surface plasmon (exciton-plasmon coupling) on the luminescence properties using the nonequilibrium Green's function method. It is found that in addition to the dynamics of the molecule, the dynamics of surface plasmons plays an essential role in determining the luminescence spectral profiles of surface plasmons. Prominent peak and dip structure observed in recent experiments are interpreted by the developed theory. The details of exciton-plasmon coupling on the luminescence properties will be discussed.

> Kuniyuki Miwa Department of Applied Physics, Osaka University

Date submitted: 13 Nov 2013

Electronic form version 1.4