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Mechanism for Edge-enhanced Optical Response of Tip Induced Plasmonic Emission[1] GUO LI, Univ. of Sci. & Tech. of China; Institute of Physics, CAS, China, LIUGUO CHEN, CHAO ZHANG, ZHENCHAO DONG, Univ. of Sci. & Tech. of China;, ZHENYU ZHANG, Univ. of Sci. & Tech. of China; Harvard University — In the investigation of tip induced plasmonic emission supplemented by STM, molecular layers are always viewed as spacers suppressing the induced emission. However, our nanoscale photo mapping of H_2TBPP/Ag(111) strikingly showed enhanced emission at the molecule-island edge, which is even remarkable higher than that on the bare Ag surface. To understand this intriguing phenomenon, DFT calculations have been carried out. We found that when an organic molecule is absorbed on Ag surface, its HOMO couples with the Ag states around the Fermi level, and forms an inelastic tunneling channel. The involved states of this channel accumulate in the interface and around the phenyl groups. Therefore, when the STM tip locates at the edge of the molecular island, the proportion of the inelastic tunneling current increases and the photo emission is enhanced. We also found that this edge-enhanced photo response is generic; the investigations of other molecule/metal systems demonstrate similar results.

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