Optical characteristics of thin films of metal organic frameworks placed on silver mirror/anisotropic silver nanoparticle aggregation systems.

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Keyword: Surface plasmon resonance; strong coupling; metal organic frameworks

Strong bonding states are very promising for increasing energy transfer from photon to molecular. In particular, although both strong plasmonic electromagnetic fields and significant molecular light absorption coefficient are required for realizing the plasmon-based strong coupling, the formation of molecular aggregates may impair the intrinsic molecular properties. In this study, to achieve the plasmonic strong coupling with phosphorescent molecules, hybrids consisting of precise molecular assemblies of Pd(II)-meso-tetra(4-carboxyphenyl) tetrabenzoporphyrin (Pd-TCPTBP) based on metal organic framework (MOF) technique and plasmonic metal-insulator-metal (MIM) structures. The MOFs, which were fabricated by alternating immersion of a zinc acetate solution and a Pd-TCPTBP solution, showed a gradual increase in the extinction intensity derived from Pd-TCPTBP (Figure 1(A)). These results suggest that Pd-TCPTBP MOFs were grown by coordination bonds or other means. For the MIM structures were fabricated using the self-assemblies of silver nanodisks[1] and silver thin films on a glass substrate. And the insulators were inserted between them by layer-by-layer deposition of polymer thin film. Figure 1(b) suggests strong interaction between nanodisks and silver thin films. The absorption and extinction spectra of MOFs on the MIM substrate (Figure 1(c)) suggest that strong interaction between MOFs and MIM-based plasmon because of the generation of an optical dip at the exciton peak of MOFs.

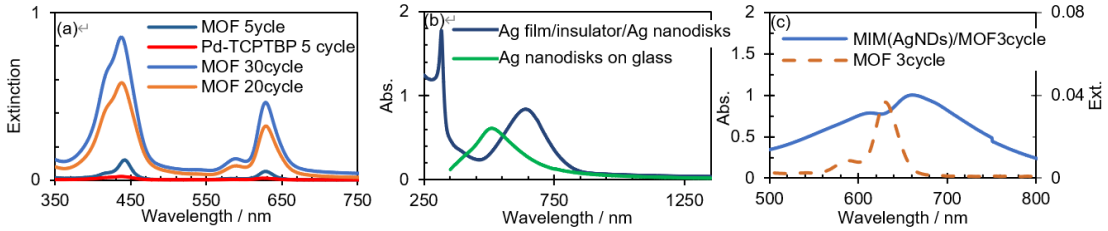

Fig. 1. (a) Extinction spectra of MOFs and Pd-TCTBP (alternating immersion cycle number: 5, 20, 30). (b) Extinction spectra of MIM structures and Ag nanodisk assemblies. (c) Absorption spectra of MIMs-MOFs (3cycles) hybrids and extinction spectra of MOFs.

Reference: 1) K. Sugawa et al., *Nanoscale*, **2022**, *14*, 9278.