Plasmon-Induced Decarboxylation of Mercaptobenzoic Acid on Nanoparticles Film Monitored by Surface-Enhanced Raman Spectroscopy

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1. The SEM images of the prepared Au and Ag nanoparticles.

Based on the literature, the uniform Au nanoparticles were prepared with diameter of about 30 nm (See the Figure S1a). As for the Ag, the final products included the nanoparticles and nanorod, and both nanostructures were involved in the film (Figure S2).

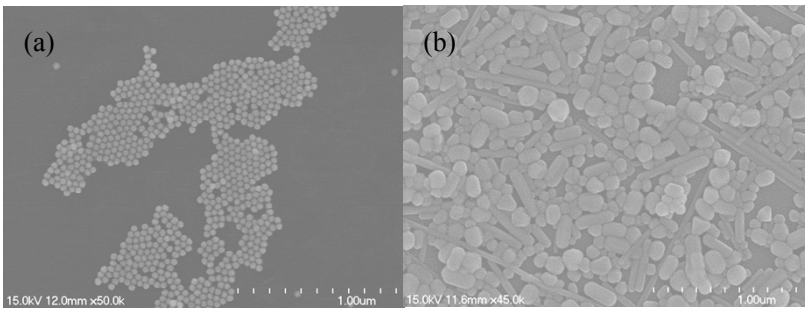

Figure S1 SEM images of Au nanoparticles (a), Ag nanoparticles (b).

2. Surface morphology of Au nanoparticle monolayer film before and after the catalytic reaction.

Figure S2 present the SEM images of Au nanoparticle monolayer film attached with PMBA before and after the catalytic reaction. Actually, the plasmon induced decarboxylation was occurred on the Au nanoparticle film attached onto a Si wafer. We observed the surface morphology of the Au nanoparticle film attached with PMBA before and after the catalytic reaction (as shown in Figure S2a and b). However, the changes of the nanoparticle film can hardly be observed before and after catalytic reaction. It should be pointed out that the different density of the nanoparticles was mainly due to the different measured area before and after the catalytic reaction.

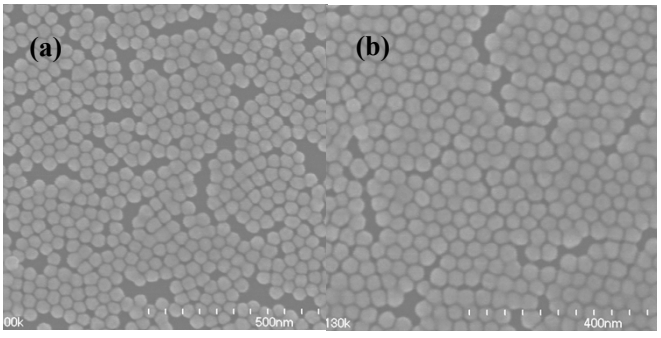

Figure S2 SEM images of Au nanoparticle films modified with PMBA before (a) and after (b) the

catalytic reaction.

3. pH dependent decarboxylation reaction

Investigation of aqueous solutions at pH 5 and 10 has also been done and relevant SERS spectra were shown in Figure S3. The very similar results were obtained, in which the occurrence of decarboxylation reaction was favorable in alkaline solution than in acidic solution. Moreover, the high pH value resulted in the high conversion of PMBA to TP.

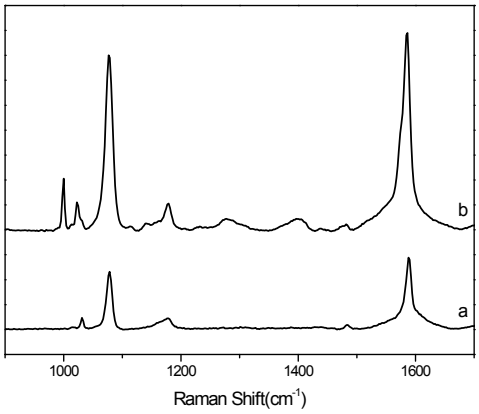

Figure S3 SERS spectra of PMBA on Au film measured in aqueous solution at pH 5 (a) and pH 10 (b) respectively, laser 633 nm.

4. Decarboxylation reaction on different kinds of Au substrates.

Figure S4 presented the SERS spectra of PMBA adsorbed on 110 nm Au nanoparticles (in air), roughened gold electrode(at pH=12) and Au (111), respectively. By careful comparison on the spectra obtained from the different substrates, the difference in the spectral was ambiguously. It indicated, to some extent, the effect of particle size on the decarboxylation reaction was not dominated.

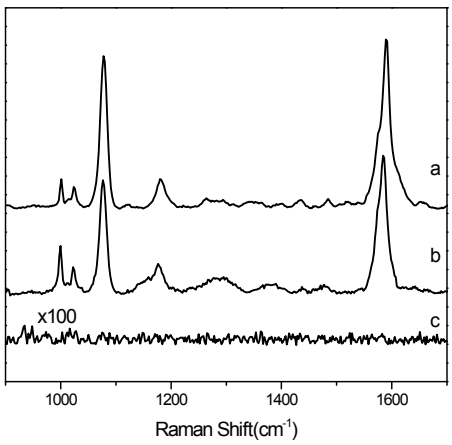

Figure S4 SERS spectra of PMBA adsorbed on 110 nm Au nanoparticles (in air) (a), roughened gold electrode (at pH=12) (b) and Au (111) (c).