Pd/Au single atom alloys for light-induced catalytic reaction

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Utilizing solar energy for chemical reaction have has received huge attraction to overcome the limitation of conventional thermal catalytic reaction. Recently, it has been reported that plasmon-induced energetic hot electrons transfer to reactant molecules on the metal surface and activate the molecular orbitals of adsorbates or metal-adsorbate complexes, resulting in enhancement of reactivity and selectivity. However, it remains challenging because plasmonic noble metals enabling efficient absorption of light in UV-Visible range have inherently insignificant catalytic properties. Therefore, multi-metallic plasmonic catalytic architectures integrating the plasmonic metal with the catalytic metal has required as a new direction to open the possibility for increasing the reaction activity further in photo-assisted catalytic reaction. In this study, we develop dilute Pd/Au alloys where single- or multi-isolated Pd atoms are decorated on the surface of Au nanoparticles with different concentration. We also investigate the optimized structure of muti-metallic nanoparticles to maximize the effect of surface plasmon on chemical reaction.