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**Silver palladium bimetallic core-shell structure catalyst supported on TiO₂ for
toluene oxidation**

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Abstract: We show that silver palladium bimetallic core-shell structure catalysts supported on TiO₂ substrate (Ag@Pd/TiO₂) are highly active with a low palladium loading for toluene purification in oxidation reaction. The Ag@Pd catalysts were synthesized by galvanic replacement of Pd coating on Ag nanoparticles. Transmission electron microscopy (TEM), high-resolution TEM, and scanning TEM with energy dispersive spectrometer confirmed that the catalysts have a core-shell configuration, and are spherical in shape with an average diameter size of about 9.0 nm. The UV-vis absorption spectroscopy and selected area electron diffraction further proved that the intimate contact and different electronegativity of Ag and Pd in core-shell structure result in electrons transferring from Ag core to Pd shell, which increases local electron density around Pd atom. In addition, X-ray photoelectron spectroscopy reveals that such an increase of electron density on Pd active site in Ag@Pd/TiO₂ catalyst can substantially strengthen the chemisorption with reactant of O₂, further promote the phase transformation from Pd⁰ metal to PdO oxidation state, and finally maintain the

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