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Photocatalytic Degradation of Methyl Orange by Ag Doped $La_2Ti_2O_7$

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Abstract : Photocatalytic degradation is an appealing process to remove organic contaminants from industrial wastewater, but usually impeded by less effective photocatalysts. Here, we successfully synthesized Ag doped $La_2Ti_2O_7$ via a simple sol-gel route for photocatalytic methyl orange (MO) degradation. Their crystal structures, morphology, surface area and optical absorption activity were systematically characterized by X-ray diffraction, scanning electron microscope, BET N_2 adsorption-desorption study, and UV-vis diffuse reflectance spectra. The photocatalytic activity was evaluated by MO photodegradation under a 300 W xenon lamp. The results indicate that the doping of Ag has effectively narrowed the band gap, increased the specific area of La2Ti2O7, and supressed the recombination of photogenerated carriers. Compared with the pristine $La_2Ti_2O_7$, $La_{1.9}Ag_{0.1}Ti_2O_7$-δ revealed a superior performance for MO degradation with a degradation rate of 97% in only 60 min. Also, the pseudo-first order kinetic constant for $La_{1.9}Ag_{0.1}Ti_2O_7$-δ is ~ 11 times higher than that of undoped sample. The outstanding performance of Ag modified $La_2Ti_2O_7$ is probably attributed to the integrated factors. Active species trapping experiments indicated that h+ plays a critical role in MO degradation, while $\bullet O_2-$ has slight effect on the photocatalytic activity and the function of •OH can almost be neglected.

Keywords : Ag doped $La_2Ti_2O_7$, methyl orange, photodegradation, surface plasmon resonance
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