Synthesis of Cu_2O@Ag Bumpy Nanoparticles with Enhanced Photocatalytic Performance

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Cuprous oxide (Cu_2O), known as a p-type semiconductor, has been widely studied because of low price and adequate band gap for photocatalyst [1]. When the semiconductor material is combined with novel metals such as Au, Ag and Cu in the form of composite catalyst, it is called as plasmonic photocatalyst and shows much higher photocatalytic activity due to enhanced light adsoprtion ability [2].

In this work, we synthesized Cu_2O-Ag core-shell nanoparticles with various shell thickness using a facile one-step process. The structure was investigated using transmission electron microscopy (TEM), energy-dispersive spectroscopy (EDS), and X-ray diffraction (XRD). The optical properties of the nanoparticles were examined using UV-vis adsoprtion spectroscopy.

Furthermore, we investigated the photocatalytic properties of the Cu_2O-Ag core-shell nanoparticles using the methyl orange method to compare with Cu_2O nanoparticles. The Cu_2O-Ag core-shell nanoparticles exhibit enhanced photocatalytic activity over an extended wavelength range because of the localized surface plasmon resonance (LSPR) effect of the Ag core nanoparticles. The Cu_2O-Ag core-shell nanoparticles showed the better photocatalytic activity than Cu_2O nanoparticles. This work has indicated that the Cu_2O-Ag core-shell nanoparticles can be a superior visible-light plasmonic photocatalyst.

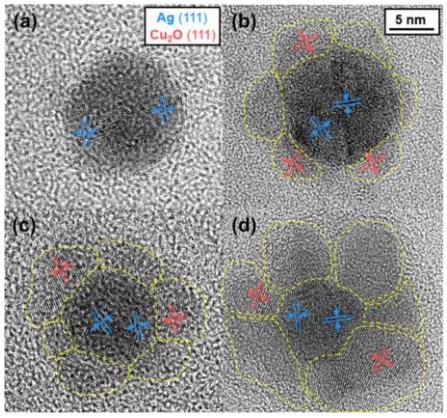

Fig.1 TEM images of Cu_2O@Ag bumpy nanoparticles with various shell thickness.

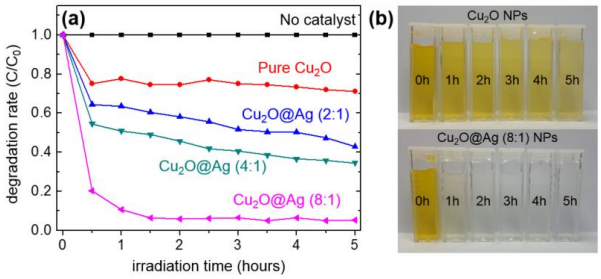

Fig. 2 Photocatalytic degradation of MO.

REFERENCES

[1] S. Sun, Nanoscale, 7 (2015) 10850.
[2] X. Zhang, T. L. Chen, R-S. Liu and D. P. Tsai Rep. Prog. Phys., 76 (2013) 046401.