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High Efficient Photocatalytic Hydrogen Evolution from Formaldehyde over Sensitized Ag@Ag-Pd alloy catalyst under Visible Light Irradiation

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Graphic Abstract

High active catalyst for hydrogen evolution from formaldehyde *via* alloying of Pd with Ag and sensitization with a dye (EY) has been developed. The XRD, XPS, TEM and HRTEM characterizations indicated that the catalyst exhibited a core-shell structure (Ag core and Ag-Pd shell). Alloying Pd with Ag not only provides more efficient catalytic sites than single component Pd catalyst, but greatly promotes the efficient electron transfer and prolongs the lifetime of photogenerated electrons, enhances the charge separation efficiency and the photocatalytic hydrogen evolution activity significantly. The catalyst activity for hydrogen is highly dependent on the adsorption energies of HCHO and H₂O molecules on metal surface of the alloy catalyst.

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