Nanocomposites and nanomaterials

Modification of the surface of mesoporous TiO_2 by Ag/Cu bimetallic nanostructures for improve the process of photocatalytic reduction of CO_2

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In this work we present a study on mesoporous TiO_2 samples modified by bimetallic nanostructures Ag/Cu via photochemical reduction of Ag^+ and Cu^{2+} ions on the surface of titanium oxide. Deposited metal atoms form the nanoparticles within the sizes of 10-20 nm. Such heterostructures were studied in a reaction of gas-cycle CO_2 photocatalytic reduction by water vapor. We showed that such modification of mesoporous TiO_2 has a higher activity in the reaction of CO_2 photocatalytic reduction comparing to the same sample modified by individual metallic nanoparticles (TiO_2/Ag or TiO_2/Cu). We found the optimum molar Ag/Cu ratio (1:6) in heterostructure corresponds to the highest rate of CO_2 photocatalytic reduction to CH_4. It is shown the dependence of the activity of nanoheterostructures on the sequence of metal deposition, where the maximum rate of accumulation of CH_4 observed in the deposition Ag nanoparticles followed by precipitation of the copper layer.

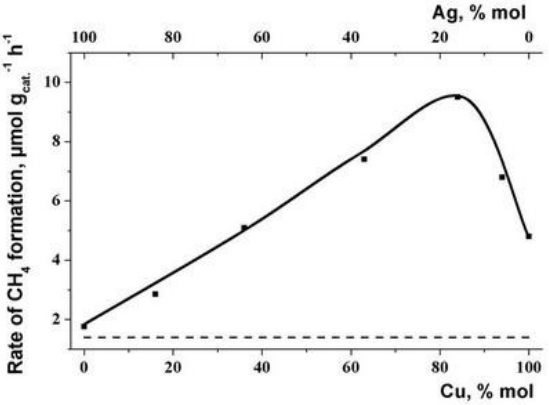

Fig. CH_4 accumulation rate as a function of TiO_2/Ag/Cu heterostructure composition of metal in molar concentrations. Dotted line depicts methane accumulation rate using individual TiO_2.