Nanocomposites and nanomaterials

Photocatalytic Activity of Nanostructured Composites Based on C_3N_4 and Layered Niobate for Enhanced Hydrogen Production from Solutions Electron Donor under Visible Light

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The paper studies photocatalytic activity of nanostructured composites based on layered niobate and C_3N_4 in process hydrogen production from solutions electron donor under visible light. It establishes that the rate of hydrogen evolution from electron donors water solutions under visible light using composites niobate/C_3N_4 as photocatalysts significantly exceeds the rate value for an individual C_3N_4. This acceleration of photoreaction may be associated with improved photogenerated charge separation between the components of the composite KNb_3O_8/C_3N_4 due to the favorable location of the energy bands, leading to a significant reduction in the efficiency of electron-hole recombination, and consequently, to increase of photoactivity. The rate of photoreaction with composite in comparison with individual C_3N_4 increases 5 times in optimal conditions.

The article determines optimum conditions of the reaction of hydrogen production under the visible light using as photocatalyst heterostructures KNb_3O_8/C_3N_4. In particular, it determines that the most effective among the investigated electron donor reagents are formic and lactic acid. The paper shows that the efficiency of photocatalytic hydrogen evolution depends on the content of the studied co-catalysts in the reaction system and has the form of dome-shaped curves.

The activity of the studied co-catalysts increases in the number of Au Pd/SiO_2 Pd and achieves best-value 120 molhour^{-1}gph^{-1}. The paper establishes that thin layers of niobate have higher activity in composite KNb_3O_8/C_3N_4. It can be attributed to their better contact with the surface of carbon nitride, more efficient transfer of electrons from the surface of carbon nitride particles to the co-catalyst and manifestation of quantum size effects.