

HALLOYSITE-BASED PHOTOCATALYSTS FOR HYDROGEN EVOLUTION FROM AQUEOUS Na_2S – Na_2SO_3 SOLUTIONS UNDER IRRADIATION WITH VISIBLE LIGHT

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In nanotechnology different nanomaterials are used like carbon nanotubes, nanofluids, nanoparticles, nanoemulsions, nanocapsules, etc. These materials are often toxic and the results of their application are not considered safe for humans and for the environment as well. That is why naturally occurring nanomaterials are of great interest for scientist. One of the most promising natural nanoobjects are halloysite nanotubes. The tubular structure of halloysite combined with site-dependent aluminosilicate chemistry enables abundant possibilities for its various applications and modification. Halloysite is a perspective carrier for metal containing nanoparticles of different functionalities like quantum dots (QDs). CdX (X – S, Se, Te) QDs are known to perform high catalytic activity but tend to aggregate without stabilization. The dispersion of such photocatalysts on halloysite carrier can increase surface area by minimizing the aggregation of particles [1].

Here we report a facile ligand assisted preparation method of halloysite based nanomaterials with CdX and hybrid nanoparticles assembled on the outer surface of nanotubes and in the mesoporous lumen of halloysite nanotubes. The transmission electron microscopy, X-ray energy dispersive spectroscopy, elemental analysis were used for samples characterization. The activity of the synthesized materials was estimated in the photocatalytic hydrogen evolution from aqueous solutions of sodium sulfide and sodium sulfite under irradiation with visible light [2]. The influence of synthesis parameters like X/Cd in precursor solutions, reaction time etc. on catalytic activity of synthesized materials was investigated. The prepared nanomaterials showed high catalytic performance in the reaction of hydrogen evolution from aqueous solutions of sodium sulfide and sodium sulfite under irradiation with visible light.

1. Weinan Xing et al, *Desalination and Water Treatment*, Vol. 53, Iss. 3, 1-12, 2015: “Effect of metal ion (Zn^{2+} , Bi^{3+} , Cr^{3+} and Ni^{2+})-doped CdS/halloysite nanotubes (HNTs) photocatalyst for the degradation of tetracycline under visible light”.
2. Markovskaya Dina V. et al, *Chemical Engineering Journal*. V. 262. P. 146-155, 2015: “Photocatalytic Hydrogen Evolution from Aqueous Solutions of $\text{Na}_2\text{S}/\text{Na}_2\text{SO}_3$ under Visible Light Irradiation on $\text{CuS}/\text{Cd}_{0.3}\text{Zn}_{0.7}\text{S}$ and $\text{Ni}_z\text{Cd}_{0.3}\text{Zn}_{0.7}\text{S}_{1+z}$ ”.

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