сам максимум ε уменьшается по высоте и становится более размытым (рис. 1). Размытие фазового перехода связано, по-видимому, с замещением атомов Ba на атомы Sr, в результате чего образуются области, имеющие свои локальные температуры Кюри, зависящие от состава [2]. В соответствии с [2] была получена зависимость параметра размытия σ от концентрации атомов Sr (вставка на рис. 1). Видно, что с ростом концентрации атомов стронция σ увеличивается, что в рамках модели флуктуаций состава объясняется разупорядочением распределения ионов Ba и Sr в узлах кристаллической решётки.

Исследуемые образцы претерпевают фазовый переход первого рода, который сопровождается возникновением локальных полярных областей в неполярной матрице. Поэтому была проведена оценка объёмов локальных полярных областей β и исследована их зависимость от концентрации Sr. Было выявлено, что увеличение содержания атомов Sr приводит к уменьшению объёма зародышей новой фазы вещества (вставка на рис. 1). Такая зависимость объясняется уменьшением величины спонтанной поляризации и, как следствие, снижением энергии деполяризующего поля зародышей полярной фазы.

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SYNTHESIS AND STUDY OF SULFIDE CATALYSTS FOR PHOTOCATALYTIC HYDROGEN PRODUCTION

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A series of novel catalysts $Cd_{0.4}Mn_{0.6}S$/g-C_3N_4 with different $Cd_{0.4}Mn_{0.6}S$ contents was synthesized. The obtained composites showed high photocatalytic activities in H_2 evolution reaction and the highest H_2 evolution rate of 0.23 μmol min^{-1}.

The rapid depletion of oil resources necessitates extensive mastering of alternative energy and raw material sources for the chemical industry. Serious attention is presently given to use of hydrogen as a fuel. An advantage of hydrogen is its high heating value. Furthermore, the product of its combustion is water, an environmentally friendly substance. The photocatalytic decomposition of water to hydrogen and oxygen using

solar energy is promising, but catalytic activity in this process is quite low due to the recombination of photogenerated charge carriers on the semiconductor surface. The addition of sacrificial agents in the system reduces the rate of charge recombination and increases the rate of hydrogen evolution [1].

Graphitic carbon nitride (g-C_3N_4) is a typical metal-free polymeric semiconductor material, has attracted much attention in photocatalysis due to its non-toxicity, inexpensiveness, high chemical and thermal stability, and easy preparation, also g-C_3N_4 has a band gaps are 2.7 eV and can absorb light up to 460 nm, but g-C_3N_4 suffers from drawbacks including low visible-light utilization efficiency, low surface area, and rapid recombination of the photogenerated charges, which largely limit its photocatalytic activity.

The solid solution of CdS and MnS, $Cd_xMn_{1-x}S$ allows one to control the composition as well as a band gap which makes it possible to vary the positions of the valence and conduction bands. Recently we synthesized and studied photocatalysts $Cd_xMn_{1-x}S$ (x = 0 – 1) in the hydrogen evolution reaction under the visible light [2]. The sample with x = 0.6 demonstrated the highest rate of hydrogen evolution.

Composites based on g-C_3N_4 and $Cd_xMn_{1-x}S$ have been developed as highly efficient materials for photocatalytic hydrogen evolution, because there is the formation of a heterojunction that promotes the separation of photogenerated charge carriers. The work was aimed at the synthesis and research of new sulfide catalysts for photocatalytic hydrogen evolution under visible light irradiation using 450 nm LED as a light source.

The composites were synthesized by impregnating g-C_3N_4 with a solution of the salts of cadmium and manganese, followed by the formation of cadmium and manganese hydroxides and reprecipitation with a Na_2S solution. The mass fraction of the solid solution supported on carbon nitride varied from 5 to 90%. The concentration of hydrogen was determined by means of Khromos gas chromatograph (Russia) equipped with thermal conductivity detector with argon as the carrier gas.

The activity of photocatalysts was studied in the process of photocatalytic hydrogen evolution from a 0.1M Na_2S/0.1M Na_2SO_3 suspension under visible light with a maximum wavelength of 450 nm. The highest activity, equal to 0.23 μmol min^{-1}, was exhibited by the sample 50% $Cd_{0.4}Mn_{0.6}S$/g-C_3N_4.

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