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Ag/ZnO NANOCOMPOSITES AS REAGENTS FOR WATER TREATMENT

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Abstract. Nanostructured composite materials containing silver nanoparticles are characterized by unique properties and are promising for optoelectronics, nanophotonics, medicine, etc. [1]. Mesoporous metal oxides, in particular zinc oxide, are widely used as matrices for the synthesis of nanosystems.
As a result of the study, optimal methods for the synthesis of mesoporous zinc oxide were developed. Highly dispersed zinc oxide was obtained by the interaction of zinc nitrate hexahydrate with ammonium carbonate, followed by the thermal decomposition. Silver-modified nanocomposite materials based on zinc oxide were synthesized by chemical and photochemical reduction of a silver salt in a zinc oxide matrix. It has been found that the most applicable method for the preparation of zinc oxide nanocomposites containing silver nanoparticles is the chemical reduction of silver nitrate with sodium borohydride. It is shown that, in the case of chemical reduction, Ag/ZnO nanocomposites with an average silver particle size of 14-26 nm are obtained. When using the photochemical method of reduction of silver ions, the influence of the ratio of components on the morphology of the samples was noted: with an increase in the silver salt content, the formation of silver nanoparticles is not observed, and AgCl/ZnO nanocomposites are formed.

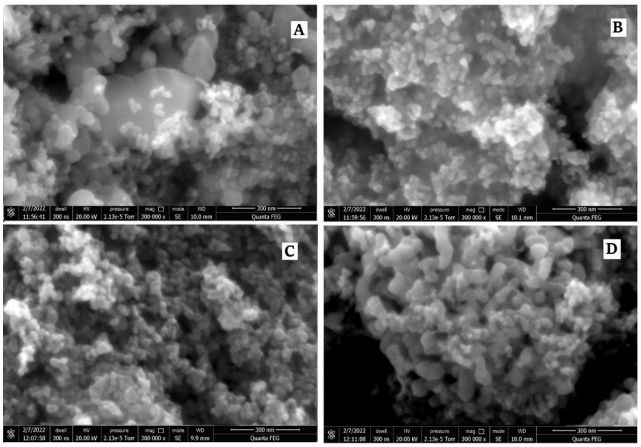

Figure 1. SEM images of silver nanocomposites synthesized by the borohydride method (A) and photochemical reduction: ZnO:$AgNO_3$:NaCl ratio - 1:0.5:0.5 (B), 1:1:1 (C), 1:2:2 (D).

The study of the bactericidal action of materials against bacteria in drinking water showed that when Ag/ZnO is used, the growth of bacteria stops completely after 1 day. The high bactericidal activity of nanocomposites makes it possible to use them as reagents for water purification.

References

1. Silver Colloid Nanoparticles: Synthesis, Characterization, and Their Antibacterial Activity / A. Panáček, L. Kvítek, R. Prucek [et al.] // J. Phys. Chem. B. – 2006. – Vol. 110. – P. 16248 –16253.

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