DEVELOPMENT OF CLAY-BASED NANOCOMPOSITE MATERIALS

Raman Novikau[1], Galina Lujanienė[1*], Kęstutis Mažeika[2], Sergej Šemčuk[1*]

[1] Department of Environmental Research, Center for Physical Sciences and Technology, Lithuania
[2]Department of Nuclear Research, Center for Physical Sciences and Technology, Lithuania
novikaur95@gmail.com

Nowadays, the main sources of environmental pollution are waste products of the various kinds of industrial enterprises. In this regard, the development of biocompatible adsorbents, the use of which would be aimed at wastewater treatment to remove potential pollutants: organic and inorganic, to minimize their environmental impact, is relevant [1, 2].

The use of clay as an adsorbent is due to the peculiarities of its structure, as well as its economic availability and ubiquity, the tendency to use clay has undergone several changes, from its pure use to modifications and combination with other adsorbents, obtaining composite materials, as well as by combining various methods for obtaining new composites [3, 4].

The problem of using most of these composites is due to low and/or medium biocompatibility, as well as the possibility of secondary environmental pollution.

The study aimed to develop a nanocomposite of clay – graphene oxide – magnetite/maghemite, obtained by different synthesis methods.

Graphene oxide was obtained by the Hammers method. Magnetite/maghemite based nanocomposite were synthesized in a solution containing graphene oxide by a liquid-phase method based on the coprecipitation of salts of ferrous and ferric iron with aqueous ammonia.

Then, the obtained graphene oxide – magnetite/maghemite nanocomposites and clay were dispersed in water in an ultrasonic bath for 8 hours. The Triassic clay from Šaltiškiai quarry located in the North of Lithuania was used in this study. The mass ratio of clay:graphene oxide – magnetite, were as follows: 1:1; 1:0.75; 1:0.5; 1:0.25.

The second synthesis method was based on the fact that the clay – graphene oxide nanocomposite was first obtained by dispersing graphene oxide in water for 2 hours, followed by the addition of clay, and dispersed for another 30 minutes on an ultrasonic bath, then stirred for 30 minutes on a magnetic stirrer while heating, the resulting nanocomposite was dried, then separately prepared magnetite was added to it, dispersed in water on an ultrasonic bath for an hour, mass ratios were of 10:1 and 1.5:1 (magnetite:graphene oxide – clay).

The resulting nanocomposites respond well to the influence of a magnetic field, and they were also evaluated using X-ray diffraction (XRD) and Mössbauer spectroscopy. This is the first stage of our research; the second stage will be aimed at studying the adsorption characteristics of the obtained nanocomposite.

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