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THE USE OF NATURAL ADSORBENTS IN WASTEWATER TREATMENT SYSTEMS

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ABSTRACT

The study is devoted to the study of the adsorption characteristics of various types of composite coagulants-flocculants in combination with polyaluminium chloride (aluminum oxychloride) with an organic polymer. The effect of these coagulant and flocculants on reducing the turbidity of solutions was studied, as well as the characteristics of the process of cohesion and coagulation. Based on the experimental data obtained, the nature and mechanism of cohesion and coagulation for various types of composite coagulants-flocculants are discussed.

Surfactants, like dyes, are biochemical resistant compounds, the oxidation of which in the process of biochemical purification is carried out extremely slowly and not completely. If the presence of dyes in water bodies creates only unfavorable conditions for the development of aquatic organisms due to impaired photosynthesis, the presence of surfactants has a toxic effect on many aquatic organisms and slows down the process of self-purification of water bodies. Waste water from paint and finishing industries must be cleaned not only before being discharged into the reservoir, but sometimes before being sent for biochemical treatment. Based on this, in this work, preference was given to physicochemical methods of deep purification of wastewater.

АННОТАЦИЯ

Исследование посвящено изучению адсорбционных характеристик различных типов композиционных коагулянтов-флокулянтов в сочетании с полиалюминийхлоридом (оксихлорид алюминия) с органическим полимером. Изучено влияние этих коагулянтов и флокулянтов на снижение мутности растворов, а также особенности процесса когезии и коагуляции. На основе полученных экспериментальных данных обсуждаются природа и механизм когезии и коагуляции для различных типов композиционных коагулянтов-флокулянтов.

Поверхностно-активные вещества, как и красители, являются биохимически стойкими соединениями, окисление которых в процессе биохимической очистки осуществляется крайне медленно и не полностью. Если присутствие красителей в водоемах создает только неблагоприятные условия для развития водных организмов из-за нарушения фотосинтеза, то присутствие поверхностно-активных веществ оказывает токсическое действие на многие водные организмы и замедляет процесс самоочищения водоемов. Сточные воды лакокрасочных и отделочных производств необходимо очищать не только перед сбросом в резервуар, но иногда и перед отправкой на биохимическую очистку. Исходя из этого в данной работе предпочтение было отдано физико-химическим методам глубокой очистки сточных вод.

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Studied methods of wastewater treatment by biological or physic and chemical methods have shown a rather low efficiency of this method, which has led to the need to purify wastewater from dyes, dissolved organic and inorganic substances, as well as from surfactants and other heavy metal ions by a combined method of purification, i.e., sorption-coagulation - flocculation method of purification. Although sorbents can remove organic substances from wastewater with a sufficient degree of purification, the MPC of harmful substances remains at a high level. Despite the low cost, it is necessary to develop new technologies for wastewater treatment using adsorbents and reagents based on local raw materials [1-2].

In this work, we conducted experiments on the use of adsorbents from local mineral raw materials of bentonite and kaolin clays in a complex combination with coagulants: aluminum sulfate, iron chloride and PAA flocculants.

A method for treating wastewater from organic dyes is as follows: a sorbent of a certain weight with a particle size of 0.3-0.5 microns is introduced into the measured volume of wastewater and mixed for 3-5 minutes, then after adding a coagulant, it is mixed again for 5-10 minutes. The resulting suspension is settled for 20-30 minutes.

For each sample of treated water, the effectiveness of the coagulant itself was checked, taking into account the achievement of the highest degree of purification with a lower consumption of the coagulant. The degree of discoloration was determined using a photometric colorimeter (FEC)-LF-72M.

For each water sample, depending on the turbidity, color and pH of the wastewater, the necessary light filter and a 10 mm thick cuvette were selected. Distilled water was used as a comparative solution [3].

Based on the data obtained, graphs of the dependence of the effectiveness of reducing the intensity of staining on the dose of aluminum sulfate, iron chloride, and sorbent are plotted, which is shown in Fig. 1. From the data obtained, it is clear that the efficiency of treatment of colored water only for bentonite and kaolin clays is insufficient. Therefore, it is necessary to introduce a coagulant into the system after adsorption.
The contents of coagulants: 1) $Al_2(SO_4)_3 \cdot 18H_2O + FeCl_3 \cdot 6H_2O - 0.5:0.75 \text{ mg/l}$, respectively; 2) $Al_2(SO_4)_3 \cdot 18H_2O - 0.75 \text{ mg/l}$; 3) $FeCl_3 \cdot 6H_2O \text{ mg/l}$.

Figura. 1. Dependence of the change in the intensity of staining on the dose of the sorbent and coagulant

4) Without coagulant.

It should be noted that the Navbahor bentonite and Angren kaolin clays in combination with aluminum sulfate and iron chloride provide not only a high degree of discoloration, but also well purify water from highly dispersed turbidity, suspended substances, and surfactants present in it.

From the obtained data, it can be noted that bentonite clay of the Navbahor Deposit and kaolin of the Angren Deposit, when used together, can serve as an effective adsorbent in the processes of cleaning colored wastewater from silk-winding industries [4].

It should be noted that the use of polymer compositions with the developed compositions allows the maximum purification of waste water (up to 85-97%) in various technological processes of tissue production [5].

Thus, based on the conducted studies on the treatment of waste water from silk-winding production with adsorbents obtained from local mineral raw materials (bentonite clay of the Navbahor Deposit and natural kaolin of the Angren Deposit), followed by coagulation with aluminum sulfate and iron chloride and flocculation of PAA, they showed the possibility of using this effective method for removing coloring organic substances from water, i.e., unfixed dyes after the thermal fixation process.

It should be concluded that, in general, the quality of composite coagulants-flocculants in terms of their stability remained at a high level.

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