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STUDY OF SORPTION PROPERTIES OF VERMICULITE

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Currently the pollution of the World ocean is one of the most global and difficult challenges of today. According to UNESCO, 70% of the contaminants are oil and petroleum products [1]. Sorption using various artificial and natural sorbents is a promising method for cleaning weak solutions from petroleum derivatives. However, not all sorbents are effective and environmentally neutral that is why scientists search for new sorbents [4, 6]. Vermiculite concentrate or just vermiculite is one of the most promising sorbents [3]. In this paper we are going to research its properties on oil and galvanic solutions.

Vermiculite (vermiculite concentrate) is a natural mineral from the group of hydrous layered structure which has the unique ability to expand (increase in volume). Expanded vermiculite is obtained by burning [2]. Expanded vermiculite has:

- high fire resistance;
- low thermal conductivity;
- chemical and biological inertness in contact with aggressive media;
- high sorption properties;
- heat and sound insulation properties;
- high absorption capacity;
- no odor [5].

Vermiculite is an undecayable and environmentally friendly material. It does not contain heavy metals [2].

In our research we checked the sorption properties of expanded vermiculite. We used the method of permanganate oxidation (Kubel's method) [4, 6]. To determine the oxidation under static and dynamic conditions, we prepared the model solutions with oil products which concentration is 100 times higher than the maximum permissible concentration. Model oil solutions were prepared the same way: 2 liters of

distilled water and 10 ml of petroleum or petroleum products. Sorption purification was performed under static and dynamic conditions.

Static condition. As a result of the experiment a high degree of purification of all three model solutions showed expanded vermiculite. The effectiveness was 77–80%.

Object	Content of oil products, mg O/dm ³					
	Model I*	Efficiency effect, %	Model II**	Efficiency effect, %	Model III***	Efficiency effect, %
original solution	6.8	-	11.12	-	20.9	-
expanded vermiculite	1.5	77	2.3	80	4.8	77

Table 1. Results of purification by the method of permanganate oxidation (Kubel's method) in static conditions.

Dynamic condition:

Object	Content of oil products, mg O/dm ³					
	Model I*	Efficiency effect, %	Model II**	Efficiency effect, %	Model III***	Efficiency effect, %
original solution	6.8	-	11.12	-	20.9	-
expanded vermiculite	1.6	76	2.4	78	4.9	77

Table 2. Results of purification by the method of permanganate oxidation (Kubel's method) in dynamic conditions.

*Model I – 2 L of water + 10 ml of oil

**Model II – 2 L of water + 10 ml of fuel oil

***Model III – 2 L of water + 10 ml of mineral spirit

Thus, we defined the sorption properties of vermiculite on the model solutions of oil and petroleum products in static and dynamic conditions. The efficiency of purification is 76–80% by Kubel method.

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GOSSAMER ORBIT LOWERING DEVICE AS A WAY TO SOLVE THE PROBLEM OF SPACE DEBRIS

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Nowadays people have become increasingly aware of their responsibility towards future generations for the environmental pollution. It is undisputable that the destruction of the environment has serious impacts upon the quality of life in the future. At present, no one is as eager to conquer nature as it was in the early twentieth century. Humanity is facing the need of secure development and requires new knowledge about the environment and new technologies. We need to manage our natural resources more reasonably, improve the environment and protect human health. It is impossible to solve these challenges without the study of ecology and development of ecological knowledge. Environmental knowledge helps explain not only unknown aspects of reality, but also environmental risks and restrictions in relation to human activities.

Currently, much has been written about the alarming pollution of the atmosphere, oceans, rivers and soil [1, 2, 3]. Environmental pollution is associated with health problems. Emissions of greenhouse gases lead to global warming and contribute to the depletion of the ozone layer. Various