

# CHEMICAL SCIENCES

## COPPER REMOVAL FROM AQUEOUS SOLUTION USING NATURAL ADSORBENTS

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Gradual development of industrial technologies is the powerful source of negative impact on the environment, that is manifested in pollution of atmospheric air, surface and underground waters, soils and food products. That's why the massive efforts are fostered for minimization of these harmful polluting agents.

Mining industry is one of the branches leading to formation of large quantities of sewage waters containing heavy metal ions having high toxicity. They can create a danger even when they concentrations don't exceed permissible limits. Among heavy metals copper is usually considered as non-toxic one at lower concentrations ( $<5 \text{ mg/dm}^3$ ), but its presence in high concentrations leads to Wilson disease, kidney, hepatic, myocardium diseases etc. The recommended maximum permissible dose in potable water is  $1,5 \text{ mg/dm}^3$ .

There are many contemporary, conventional and unconventional methods of sewage waters treatment.

Adsorption method is considered as one of the most important methods of sewage water treatment from heavy metal ions.

The most attention is paid to sorption systems, in which the cheap, effective, natural aluminosilicates and minerals of different structure are used as sorbents.

The goal of the presented work is the study of adsorptive capacity of adsorbents prepared on the basis Georgian natural materials: mineral perlite and zeolite clinoptilolite, in the process of copper ions removal from aqueous solution.

Perlite is a natural, glasslike volcanic mineral, which expands when heated (up to 800-1200°C) 20-30 times compared to initial volume and so-called foamed perlite is obtained. Foamed perlite is used in different industries: construction, agriculture, textile and chemical industries, medicine, ecology etc.

There are many varieties of natural zeolite in Georgia, among which clinoptilolite is the most noticeable. It represents highly dispersive solid substance with quite high mechanical strength, porosity (50-60%), high content of silicium, that provides its stability towards aggressive environment. Even today, it appears relevant for sewage waters treatment.

Worth noticing that there are heavy stocks of both clinoptilolite and perlite in Georgia.

The foamed perlite provided by Georgian company Paravanperlite LLC has been used by us in tests without any preliminary processing, while resulting from one-time processing of natural clinoptilolite by 1N HCl we have obtained its hydrogen form HKI.

Experiments on Cu(II) adsorption have been conducted on both adsorbents. Certain quantity of adsorbent was placed into containers, poured by copper solution under study, then containers were closed, shook up for 1 hour, filtered and afterwards analyses on copper content were conducted.

The regularities of aqueous solution treatment from copper ions using adsorption method in the presence of foamed perlite and clinoptilolite are studied in the work.

There were studied the dependencies of adsorption degree and adsorptive capacity on adsorbent dosage, contact time and pH of solution under investigation. There are selected optimum conditions for carrying-out a process, for which the maximum adsorption degree and adsorptive capacity of foamed perlite were 94% and 11,2 mg/g, respectively, while for clinoptilolite they were equal to 92% and 11,7 mg/g.

Proceeding from the obtained data the mentioned adsorbents can be recommended for use in the process of copper removal from aqueous solution.