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# Purification of quarry water with heavy metals using plant residues

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Waters polluted by heavy metals originated as a result of permanent growth of industrial capacities and extraction and processing of mineral resources have poisonous influence on the nature. This influence is manifested in the form of pollution of atmospheric air, surface and underground waters, soils and food products.

It was established through scientific investigations that systematic penetration of heavy metals into human body is especially hazardous for health, since they are characterized by biological peculiarities, such as: accumulation ability in the organism, mutagenic, carcinogenic, embryotoxic properties metals’ toxic effect is of. One of the most prospective directions of treatment of sewage waters and waters polluted as a result of processing of polymetallic deposits is the use of artificial geochemical barriers,which is tested in the world practice.

Lots of technological schemes on installation of artificial ecological-geochemical barriers,which reduce to the minimum negative anthropogenic effect of heavy metals,are elaborated[1-2].There should be particularly noted sorption barriers prepared on the basis of different adsorbents,where naturasorbents:clays,zeolites,peat,dolomite,magnesite,talc,calcium carbonate and used[3-4].

In the given work there is studied purification of industrial waste quarry waters from copper $Cu^{2+}$ and iron $Fe^{+2}$ ions by adsorption method.Vegetable raw materials were used as adsorbents: oak bark, grape stalks, sunflower pellets, corn cob, spruce sawdust, walnut partition, plane tree leaves and pine cones.

Study of sorption properties of mentioned sorbents was conducted under static conditions. Analyses of producte have been conducted by atomic-adsorption (AAC), Perkin-Elmer (Analyst-200), photometric (KFK-2) and chemical methods.

The impact of plant raw materials adsorption degree on contact time, environment pH, preliminary processing of adsorbent in relation to heavy metals sorption is studied.

The results showed that quarry water purification runs effectively after 30 minute contact and the maximum value of adsorption degree is reached within an hour, a study of the influence of the pH of the medium on the adsorption of metals showed that the optimal PH value is 6,0. In order to compare the effect of preliminary alkali treatment on adsorption degree, the adsorbent (pine cones) was preliminary treated with 1N NaOH solution. It was shown that after alkali treatment adsorption degree in relation to $Cu^{2+}$ and $Fe^{2+}$ increases by 8 and 12%, respectively.

It is established that sorption degree dependence on environment pH is related with change in state of active centers of sorbents. In case of low values of pH hydrogen ions totally dominate, and takes place promotion of sorbent surface that assists electrostatic repulsion of metal ions and reduction of their adsorption. At higher values of pH active centers of tannin-containing compounds (oak bark, grape stalks, pine cones) undergo dissociation and form corresponding phenolate anions, which are able to bind with metals ions and form chelate complexes [5].

Experimental data show that adsorption degree for all enumerated adsorbents regarding iron is higher than in relation to copper. Probably this is because of radius size of adsorbed cations, which plays important role. According to authors data copper cation radius is bigger than of iron cation and they equal to 73 r/$P_m$ and 70 r/$P_m$, respectively [6].

When using the mentioned raw materials as adsorbents the copper adsorption degree in case of quarry water comprised 54,5% for oak bark, 30,4% for grape stalks, 43% for damp pine cones, and 38,9% for corn cobs; while the iron adsorption degree was 60,0; 40,9; 56,6 and 70%, respectively.

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