TREATING POLLUTED WATER USING INNOVATIVE MATERIALS OBTAINED FROM THE RECYCLING PROCESS OF SOME WASTE

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Abstract
Water is the source of life and the basic element of activities/processes. That is why it is particularly important to depollute polluted water and return it to the industrial and agricultural circuit and, as far as possible, make it potable.

Introduction

The research team aims to obtain new materials and develop new methods for treating polluted water. In the context of the circular economy concept, we focused on the process of recycling organic and/or inorganic waste as well as obtaining innovative materials used for the adsorption processes of organic pollutants or heavy metals from polluted water. Also, the development of new methods of polluted water treatment using the new obtained materials is another objective of the research. They are used as waste, the power plant ash and the vegetable waste like tree bark, clam shells, eggshell etc. The characterization of the newly obtained materials is done by analytical techniques such as TEM, SEM-EDX, FT-IR, BET, AAS etc.

Experimental

Before use, the waste is thermally treated at temperatures that do not affect the adsorption capacity and is micronized by mechanical grinding. The adsorption materials used are zeolite and iron oxides (eg magnetite). The composite material consisting of one, two or three wastes together with adsorbents (zeolite or iron oxides) is combined in well-defined proportions, compacted in the ball mill and immersed in the synthetic aqueous solution containing the pollutant whose adsorption is being studied. In order to optimize the adsorption process of heavy metals on the new obtained material, the role of the specific parameters of the process was studied: the pH of the solutions, the temperature, the ratio between the constituents, the contact time, the initial concentration of the pollutant. Atomic adsorption spectrometry is used to determine the adsorption capacity of materials.

Results and discussion

As a result of the experiments, new composite materials were obtained, consisting of two and three recyclable materials in different ratios, usually: 1/1; 1/2; 2/1 etc., or 1/1/1/; 1/2/1; 1/1/2; 2/1/2; 2/2/1 etc. Power plant ash and vegetable waste were used: egg shell, clam shell together with zeolite or magnetite. Different concentrations of the pollutant and different values of pH, temperature, and contact time were used. The yield of the adsorption process was between 85% and 98%.

Conclusion

In the context of the circular economy, waste as recyclable materials, is of particular interest polluted water treatment processes because some of them have a good capacity to adsorb nutrients such as nitrogen and phosphorus and/or heavy metals from wastewater, with a yield

of up to 98%. Through a simple treatment, the recovered nutrients can be returned to the agricultural circuit.

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