



Fly Ash/Chitosan Composites as Adsorbent of Heavy Metal Ions

E. Osmani, I. Dimitrievska, P. Paunovic, K. Atkovska and A. Grozdanov*

*Ss Cyril and Methodius University in Skopje - Faculty of Technology and Metallurgy
Rugjer Boskovic 16, 1000 Skopje*

*[*anita@tmf.ukim.edu.mk](mailto:anita@tmf.ukim.edu.mk)*

Water contamination is a serious problem which increases concern because of its effects on living organisms as well as the surrounding environment. Microorganisms, organics, and inorganics are the three primary types of pollutants found in water. Because of their toxicity to ecological and biological processes, heavy metals ions (HMI), which make up the majority of inorganic contaminants, have increased a lot of concern. As a result, scientists, water regulatory agencies, and government agencies are concerned about maintaining and improving water quality. Due to the problems created by the inclusion of HMs in wastewater, traditional wastewater treatment techniques such as adsorption, coagulation, flocculation, precipitation, reverse osmosis, biological process, gamma radiations, and photocatalysis were used to remove them.

The subject of this work was to obtain and to test the Fly ash/chitosan composites aimed for HMI adsorption in polluted waters. Three different types of fly ash waste particles were used, two types supplied from EURONICKEL company, and one supplied from OSLOMEJ thermal power plant, Macedonia. The surface of the fly ash (FA) particles was modified by treated with nitric acid. Several types of composite adsorbents were prepared using the chitosan as a polymer matrix. The characterization of the FA waste particles was performed by XRF, XRD, TGA, SEM and FTIR analysis, while the obtained composites were tested by TGA, SEM and FTIR analysis. It was found that the structure, morphology, and thermal properties of FA particles have been significantly changed and it is expected that it will improve their adsorption capacity towards HMI. FA/chitosan composites were tested as an adsorbent for Cu (II), and Pb (II) from aqueous solutions. The effect of contact time, solution pH, and initial metal concentration was studied in batch experiments at room temperature. Maximum metal sorption was found to occur at pH 6.0. The equilibrium adsorption data for Cu (II) and Pb (II) ions were fitted to Langmuir isotherm model. The obtained Q_{\max} values for the removal of Cu^{2+} and Pb^{2+} by FA/chitosan composites were (1.068, 1.00, 1.042, 1.369 mg/g), and (2.532, 2.063, 1.036, 2.146, 2.482 mg/g), respectively. The efficiency trend was $\text{Pb (II)} > \text{Cu (II)}$. The results indicated that the removal efficiency for Cu (II) and Pb (II) ions was 91.1% and 99.7% respectively.

Keywords: fly ash, chitosan, composite, adsorbent.