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Full factorial design to removal of zinc (II) ions from water by using hydrogel microspheres

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Zinc is one of the most plentiful elements in the Earth. Its concentration both in soil and water is increasing because of industrial activities, such as mining, coal and waste combustion and steel processing. Despite being handled by humans, too much of it can still pose fatal diseases. Therefore, zinc is to be removed from water by using several methods. With respect to recent studies, alginate has been suggested to be harmless to both environment and human health due to its biodegradable composition. Hence, it is widely used in adsorption processes. The aim of the study was to remove zinc (II) ions from water by using Ca-Alginate microspheres and also to design the adsorption by full factorial method. Na-Alginate and CaCl_2 were used to synthesize Ca-Alginate hydrogel microspheres with approximately 4 mm diameter in wet form. Microspheres were chosen to be synthesized instead of gel form in that their high surface area per their small weight could boost the efficiency of adsorption. In order to determine the significant parameters of adsorption, 23 full factorial design was performed. The combined effects of adsorbent dosage on, temperature during adsorption and initial concentration of water were examined. For three parameters, minimum and maximum values were determined to be performed. According to these values, eight experiment sets were carried out. The results of these experiments were statistically analyzed by using the student's t-test, analysis of variance (ANOVA) and an F-test to define important experimental factors and their levels. A regression model considering the significant main and interaction effects was suggested. In conclusion, using Ca-Alginate hydrogel microspheres can be plausible and environmentally friendly method for adsorption of zinc from water.



Figure 1: Ca-Alginate hydrogel microspheres in dry form

Biography

Handan Akülker graduated in Chemical Engineering and Genetics and Bioengineering double major program at Yeditepe University with full-scholarship in 2012. She worked at State Hydraulic Works as an Analyst for 3 years. Then, she started to work as a Research Assistant at Ondokuz Mayıs University in 2016. She is still a Master's student at Chemical Engineering Department.

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