SIIC048

ADSORPTION OF COPPER IONS FROM AQUEOUS SOLUTIONS BY MODIFIED ALGINATE BEADS

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Abstract:
The performance of modified polyphenolic alginate bead on their ability to adsorb copper ions in water was studied. The aim of the study is to determine the effect of tannic acid content on the modification of immobilized alginate beads for copper ions removal, evaluate the effect of pH, initial concentration and adsorbent dosage on the heavy metal removal and study on the adsorption kinetic and isotherm model. The experimental works started with the preparation of immobilized alginate beads and modification of immobilized alginate beads by tannic acid. Then, batch adsorption process and the characterization of the samples were conducted. Based on the result, the removal amount of Cu2+ ions increase from the pH solution of 2 to 7 where the amount of metal uptake increases from 0.003 mg/g to 1.457 mg/g and reach optimum. From 0.50 g of the adsorbent dosage used, the amount of metal ions adsorbed achieved about 0.69 mg/g and it increases gradually 1.007 mg/g at 2.0 g dosage and the dosage tended to be constant. The adsorption quantity of Cu2+ is 0.029 mg/g for initial concentration for 1 ppm of the solution and it increases to 0.906 mg/g when the initial concentration of the solution is 10 ppm. The kinetic and isotherm model for this study were Pseudo first-order kinetic model and Langmuir isotherm model respectively based on the better linear plot and correlation coefficient R2 value.

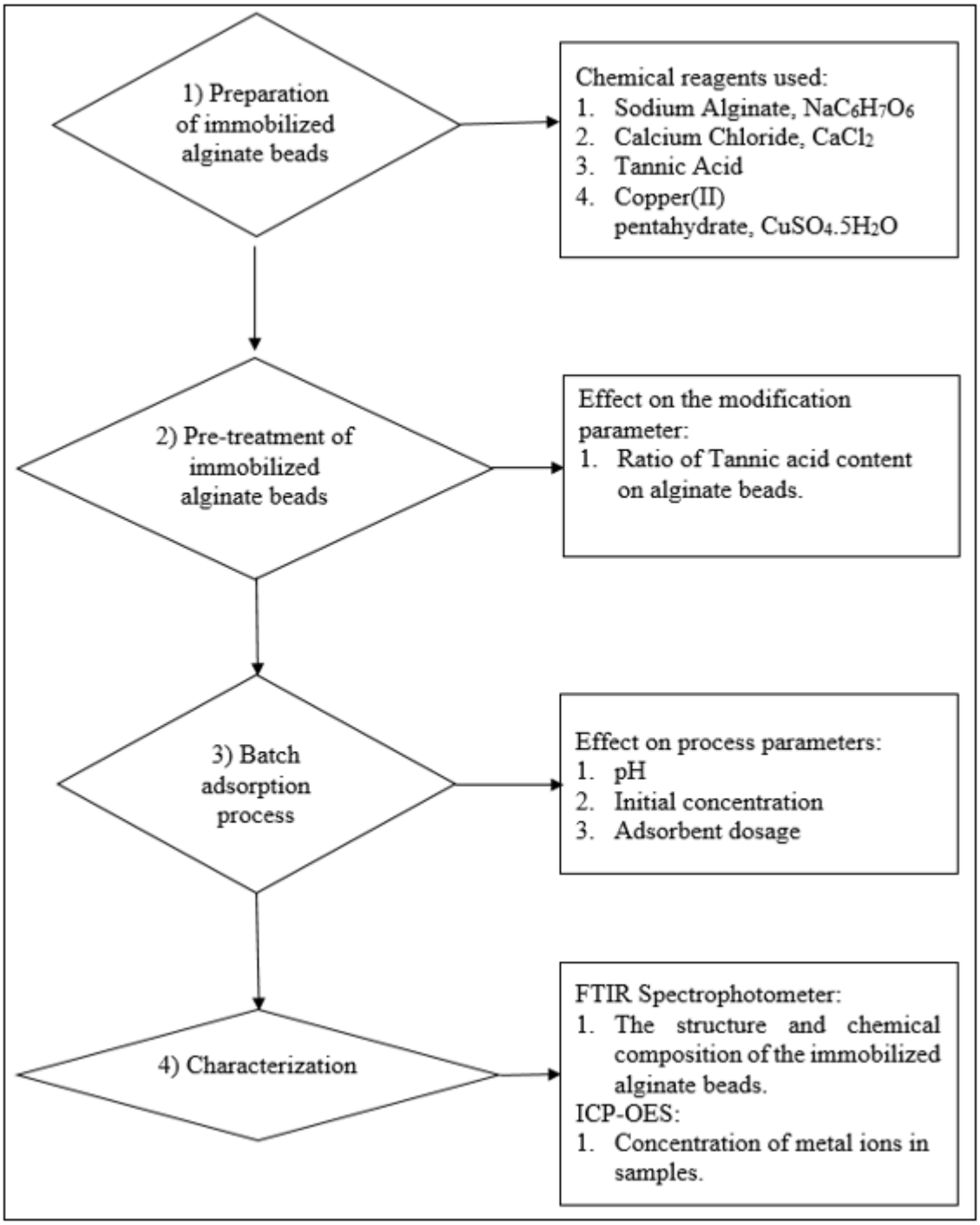
***Keywords*:**
Alginate, Tannic-acid, Immobilization, Copper, Adsorption.

Objectives:

- To determine the effect of tannic acid ratio on the modification of immobilized alginate beads for copper ions removal.
- To evaluate the effect of pH, initial concentration and adsorbent dosage on the heavy metal removal performance of sodium alginate-tannic acid (SA-TA) beads.

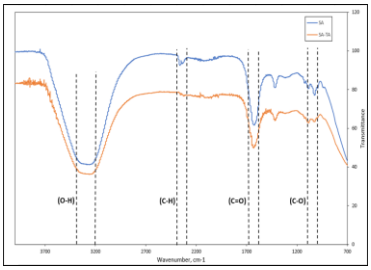
- To study on the adsorption kinetic and isotherm of copper ions adsorption by sodium alginate-tannic acid (SA-TA) beads.

Methodology:

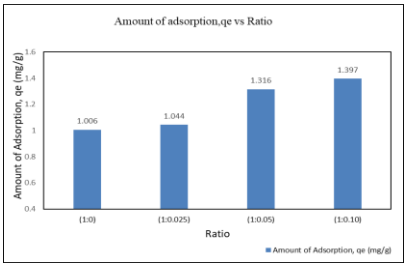


Results:

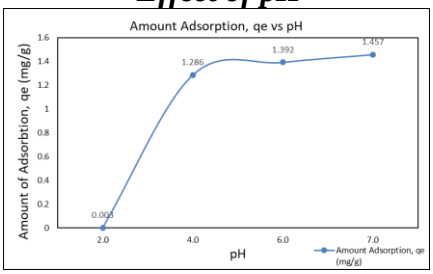
SA& SA-TA - FTIR



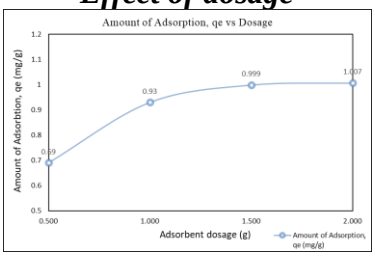
Pre-treatment SA-TA



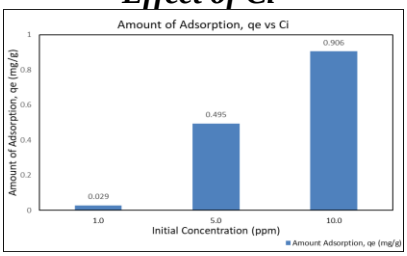
Effect of pH



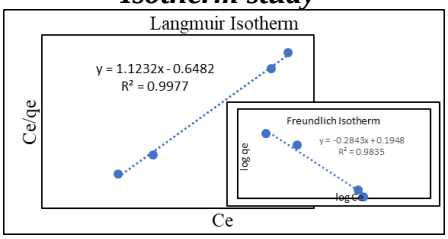
Effect of dosage



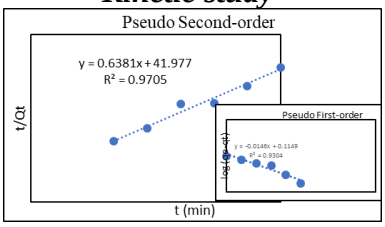
Effect of Ci



Isotherm study



Kinetic study



Conclusion:

The effect of ratio modification, adsorbent dosage, initial concentration and pH on the adsorption potential of TA-SA alginate beads was studied for the adsorption performance on Cu^{2+} removal. The tannic acid content plays an important role in the Cu^{2+} adsorption based on the experimental results. Based on the result, the adsorption amount of Cu^{2+} ions increase from the pH solution of 2 to 7 where the amount of adsorption increases from 0.003 mg/g to 1.457 mg/g. From 0.50 g of the adsorbent dosage used, the amount of metal ions adsorbed achieved about 0.69 mg/g and it increases gradually when the amount of dosage increases to 1.0 g, 1.5 g and 2.0 g where the amount of adsorption reaching 1.007 mg/g at 2.0 g dosage and the dosage tended to be stable. The adsorption amount of Cu^{2+} is 0.029 mg/g for 1 ppm of initial concentration of the solution and it increases to 0.906 mg/g when the initial concentration of the solution is 10 ppm. The study shows that the higher of pH, dosage and initial concentration gives more performance in adsorption and at some point the adsorption tend to be stable. In term of kinetic and isotherm study, Pseudo-second order kinetic model was chosen with best correlation coefficients value R^2 = 0.9705 and Langmuir isotherm model was chosen as the isotherm model for this study based on correlation coefficients value R^2 = 0.9977. To sum up, the results show that modified SA-TA improved the performance of Cu^{2+} adsorption. This work gives an efficient way to deal with structure adsorption material for copper(II), and the easy creation technique is huge for reasonable applications to treat copper-containing wastewater.