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COMPARATIVE ADSORPTION STUDIES OF ALGINATE-BASED BEADS FOR DYE REMOVAL

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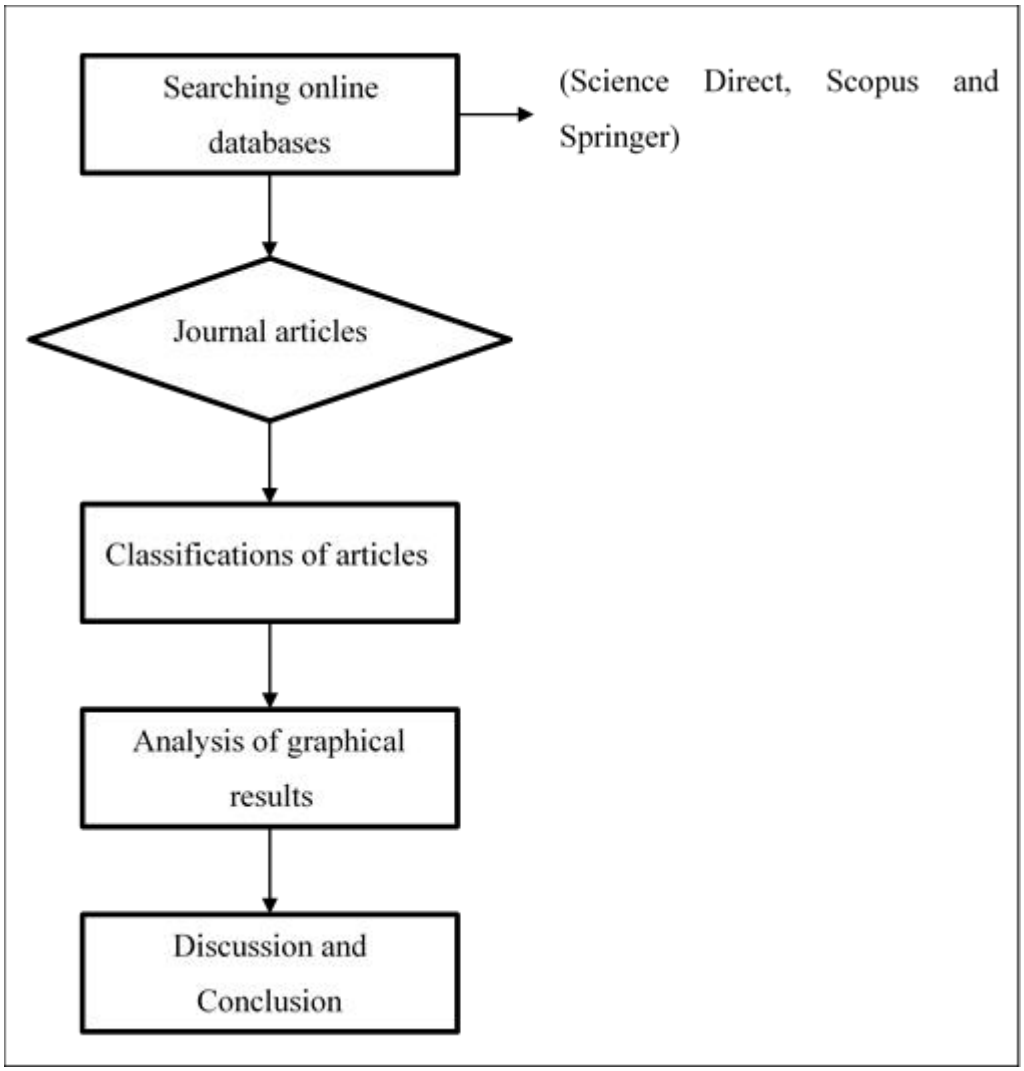
Abstract:
Toxic dye from textile industry contain harmful constituents that effect human and environment. It can cause lung and liver cancer also interfere the ecosystem of the aquatic life. The dye can be treated by physical method which is adsorption process. Adsorption process is defined as the process where adsorbate (dye) attached to the surface of adsorbent (alginate-based beads) for removal of dye. The adsorbent particularly in solid and the adsorbate is liquid. Many types of adsorbent used to solve the dye problem, one of it is sodium alginate based in the form of immobilized beads. The alginate-based beads are modified with the present of other component such as acid and magnetic compound in order to enhance the adsorption process. The process of adsorption is increase by the surface morphology of the beads is increased to adsorb more matter. Thus, a comparative study on adsorbent alginate-based beads of the literature was conducted. The literature data on types of dyes, process parameter, and characterization studies for the process were reviewed in this work. In addition, kinetic and isotherm model were evaluated in order to observe the activity of the adsorption process. Both removal of cationic and anionic have insignificant value of initial concentration, pH and contact time as the removal of dye due to the various modification of the alginate-based beads adsorbent. The dye removal on these effects depends on presence of binding site, charge of adsorbent and active site. The adsorption of dye removal also influences by the dye functional group and modified adsorbent increase in pore size and internal surface. The isotherm and kinetic model for adsorption process dominant on Langmuir and pseudo-second order respectively.

***Keywords*:**
Alginate Beads; Cation; Anion; Surface Morphology; Surface Chemistry; Kinetic; Isotherm

Objectives:

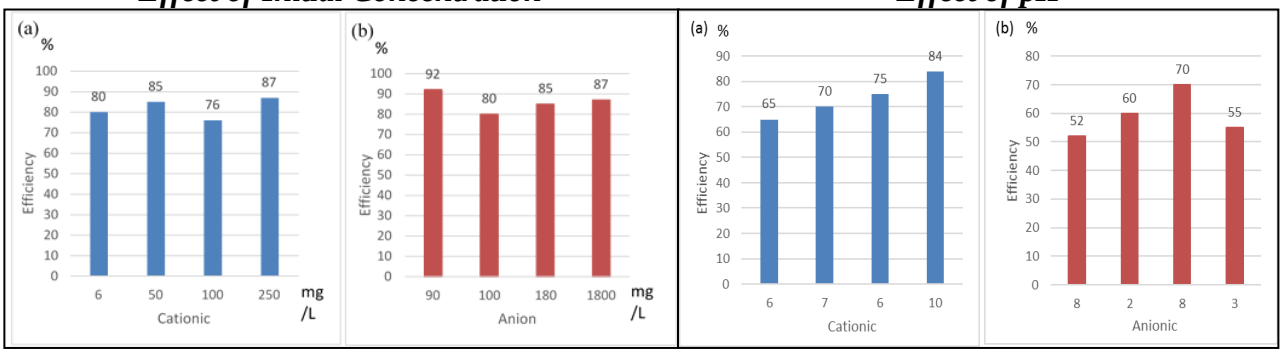
- To evaluate the performance of dyes adsorption process on the effect of adsorption parameter (pH, initial concentration, contact time) on the modified alginate beads.
- To evaluate the surface characteristics of adsorbent alginate-based beads.
- To study the isotherm and kinetic model of adsorption process for dyes removal by modified alginate-based beads.

Methodology:

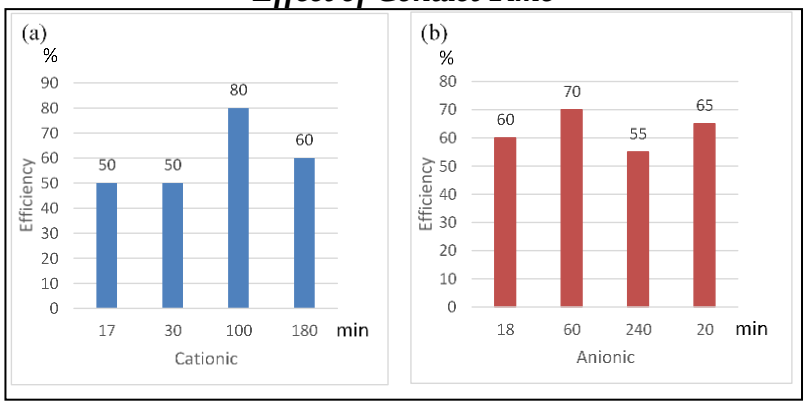


Results:

Effect of Initial Concentration ***Effect of pH***



Effect of Contact Time



Conclusion:

In conclusion, the objective this comparative study is obtained. The performance on the adsorption parameters were varies. The dye removal at high concentration occur due to the larger binding site between adsorbent and the dye compare to lower concentration, the binding site was limited and saturated. For effect of pH on the cationic type dye, high removal should occur at pH above 6, due to the cationic charge which is positive and pH above 6 are in negative charge, while anionic type of dye removes high amount of dye at pH below 6. Whereas for effect on contact time, fast rate occurs due to the limited active site and surface area of adsorbent. The characterization carried out for the process is using the FTIR for the functional group of the beads and SEM for the morphology surface of the adsorbent. Lastly, the isotherm used for the adsorption process is Langmuir model while kinetic model was pseudo-second order where isotherm and kinetic were important to observe the quantity adsorbed by an adsorbent unit mass with the quantity of adsorbent remaining in the equilibrium solution and analyzes the mechanism of adsorption with the equilibrium time respectively.