CHAPTER 5

SUMMARY OF CONCLUSIONS

5. Summary of Conclusions

In present work, the different agro waste has been used as raw material for preparation of activated carbon with chemically activation and prepared activated carbon were used for removal of heavy metal and dye from aqueous phase.

The mango seed kernel was used as raw material for preparation of activated carbon by chemical activation with H_3PO_4 and used for removal of Cr (VI) metal from aqueous phase. The characterization of prepared activated carbon was done by FTIR, SEM and BET surface area. The BET surface area was found as 490.43 m^2/g. The FTIR spectra responded the different functional group which was responsible for adsorption. The SEM image showed the uniform porous structure of prepared active carbon. The elemental analysis (C, H, N, S content) was determined by elemental analyser. The carbon content was found as 70% which are comparable with comprisal activated carbon. The adsorption experiment was conducted in batch mode for the removal of Cr (VI) metal ions from aqueous phase. The maximum uptake of Cr (VI) was found as 7.8 mg g^{-1} at pH value of 2.0, dose of 2.5 g/100 mL. The Langmuir isotherm models explained the experimental data well with maximum monolayer adsorption capacity. The pseudo second order model was fitted better for the experimental data. The positive value of entropy change (ΔH° = 43.76 KJ/mol) confirmed the endothermic adsorption process of Cr (VI) on MKAC. The value of Gibbs free energy was found as negative. The negative value of Gibbs free energy shows the spontaneous nature and feasibility of adsorption of Cr (VI) on MKAC.

The second activated carbon was prepared by almond shell by chemical activation with H_3PO_4 carbonized at 600 °C. The BET surface area was found as 1223 m^2/g. The SEM image responded the porous structure of almond shell activated carbon

(ASAC1). The different functional groups were recognized by FTIR analysis which may be responsible for adsorption process of heavy metal and dye from aqueous solution. The adsorption experiment for the removal of Cr (VI) was carried out in batch mode. The adsorption experiment was performed at different pH, contact time, dose and initial concentration of adsorbate. The maximum adsorption of Cr (VI) was found as 202.34 mg/g at pH vale of 2.0. The isotherm study was performed at different initial concentration of Cr (VI) and it was found that the Langmuir isotherm explained the experimental data more satisfactory. The kinetic study of the adsorption process showed that the adsorption of Cr (VI) was followed pseudo-second order kinetics.

The almond shell were also used for preparation of activated carbon with H_3PO_4 activation and carbonized at 700 °C, and used for removal of methylene blue from aqueous solution. The BET surface area of ASAC2 was calculated as 1250 m^2/g. The prepared ASAC2 was utilized as an economical and easily available adsorbent for removal of MB dye having high adsorption extent of 333.34 mg/g at 30 ºC which is more than in compression to many other activated carbon. The calculated equilibrium data of MB adsorption onto ASAC2 were best explained by Langmuir isotherm model and the MB removal kinetics were evaluated and designed by pseudo-second order kinetic model.

Adsorption is a promising field to identify the suitable adsorbents for removal of pollutants from waste water. In future these prepared activated carbons can be used for the removal of other pollutants such as, heavy metals and dyes from aqueous phase. Future study is also required to scaling of technology from lab to industrial level for the preparation of activated carbon from agro waste.