CHAPTER II

2. AIM AND SCOPE

2.1 AIM

The aim of this research work is to study the removal of heavy metal ions and dyes from aqueous solution by adsorption technique using locally available activated low cost nano adsorbent as an alternative to existing commercial adsorbents.

2.2 SPECIFIC OBJECTIVES

The overall objective of the thesis is to produce environment acceptable water using suitable adsorbent. This can be achieved by the following specific objectivities:

- ✓ To find the very effective methodology/technique to treat liquid hazardous wastes.
- ✓ To find the hazardous free and re-useful adsorbent.
- ✓ To prepare and characterize the cheaper and naturally available adsorbent.
- ✓ To determine the adsorbent dose, agitation/equilibrium time, pH, effect of initial concentration of metal ions and dyes at different temperatures and effect of other ions.
- ✓ To calculate the adsorption capacity and intensity using Langmuir and Freundlich isotherm models.
- ✓ To evaluate the equilibrium, thermodynamic and kinetic parameters.
- ✓ To desorp metal ions and dyes from metal loaded and dye loaded adsorbents and to determine the mechanism of adsorption.

2.3 SCOPE OF THE PRESENT WORK

As most industrial wastes contain toxic substances, their disposal into natural water bodies is objectionable. The effluent treatment in developing country is an expensive one and major cost is associated with the dependence on imported technologies and chemicals. The innovation of eco-friendly treatment techniques and chemicals locally or use locally available non-conventional materials to treat pollutants seems to be the solution to the increasing problem of treatment of the industrial effluents. In recent years, the developing countries focus on technically feasible and economically viable methods for the treatment of effluents.

Many techniques have been employed over the years for the removal of pollutants from contaminated effluents. The most important such methods are filtration, ion-exchange, chemical precipitation, solvent extraction, membrane filtration, electrochemical, oxidation and adsorption. All these methods have their inherent advantages and limitations in application. Among the several methods mentioned, adsorption seems to be the one, which has been the most favoured due to the simplicity, high success rate, less man power, less adverse effect, time factor and reliability.

A large number of materials have been reported for the removal of heavy metal ions and dyes through adsorption by many scientific workers. Residual toxicity, slow pays of the process, cost factor, low availability and rational loss cause serious setback in their suitability as an agreed adsorbents. In order to minimize the processing costs, the several investigations have focused on the use of low cost adsorbents such as waste agricultural materials, clay minerals and bio adsorbents. Activated carbon derived from locally and readily available plants offers a cost effective to conventional treatments. These plant

materials are biodegradable, cheap, indigenous, easy and safe to handle and redeemable. In addition, these are non-toxic, abundant, eco-friendly and adoptable to laboratory condition. Hence, this study aimed at the identification of activated nano carbon prepared from naturally available plant. In the present investigation, activated nano carbon prepared from *Gloriosa superba stem* was used as an adsorbent because; this one is distributed in tropical and sub-tropical regions.

Among the various types of pollutants, heavy metal ions and dyes have more adverse effects on human beings and animals. Since Fe(II), Cu(II), Cr(VI) and Ni(II) and are the largest among the various metal ions discharged into the environment by manmade and industrial activities, Hence, these are selected for the present study. As malachite green, rhodamine B, methylene blue and safranin dyes are occupying the predominant place in the dyeing process; hence these are selected for the present study. The systematic adsorption study of Fe(II), Cu(II), Cr(VI) and Ni(II) ions and malachite green, rhodamine B, methylene blue and Safranin dyes using *Gloriosa superba stem* nano carbon are discussed in detail manner in the following chapters.

Gloriosa superba stem