ABSTRACT

Biosorption is an effective way for the removal of heavy metals from wastewaters. In this study adsorption behavior of one conventional adsorbent i.e. granulated activated carbon (GAC) and four low cost bio-wastes viz. cow dung ash (CDA), mango stone ash (MSA), orange peel powder (OPP) and corn cob ash (CCA) was investigated and compared for the adsorption of four different metal ions, namely:

- Chromium (VI)
- Nickel (II)
- Copper (II) and
- Cobalt (II)

Static batch adsorption experiments were conducted for above mentioned adsorbents and metals in which effect of pH, adsorbent dose and effect of initial metal ion concentration was studied in order to get best suited values of these parameters.

Spectrophotometrical analysis was carried out to determine the concentration of metal ions in the aqueous solution in each experimental procedure. For batch adsorption process aqueous solution of different concentrations ranging from 50mg/L to 500mg/L were used for each metal ion. For each metal ion a calibration curve was drawn using standard analytical procedures at known concentration so that metal ion concentration after carrying the adsorption experiment could be determined.

Batch adsorption experimental data for each metal ion and for all five adsorbents used in this study was fitted to simple adsorption isotherm, Langmuir as well as Freundlich isotherms at varying adsorbent doses and initial metal ion concentration values. Various constants related to these isotherms like Langmuir adsorption capacity (Q), energy of adsorption (b), Freundlich adsorption parameter (Kf) and process intensity parameter (n) were calculated from the slope and intercept.
of the graphs drawn from the data obtained. Apart from this a dimensionless separation factor $R_L$ was also determined from the Langmuir constants. In addition to this coefficient of correlation, $R^2$ and standard deviation, $\sigma$ was also noted. The results showed that data fitted well to these isotherms. Except for the removal of Cr(VI), biowastes out performed GAC in static batch mode as well as in dynamic continuous column process. It was found that adsorption was better in static batch process as compared to adsorption in continuous flow method.

Outcomes of this study show that CDA, MSA, OPP and CCA can be used as an alternative to the conventional activated carbons for the removal of metal ions from the wastewaters as these can reduce the cost of the operation.