INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.

Thesis Title: EVALUATION OF ANILINE FORMALDEHDYE CONDENSATE POLYMER IN TWO DIFFERENT FORMS FOR HEAVY METALS AND ANIONIC DYES ADSORPTION FROM WASTEWATER

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Thesis Submitted to the Department/ Center : CENTRE FOR THE ENVIRONMENT

Date of completion of Thesis Viva-Voce Exam : 01/11/2018

Key words for description of Thesis Work : Amine functional groups; AFC-silica; Pani-jute; Modified-AFC; Anionic azo dyes; Mesoporous; Protonated amine group; Sips isotherm

SHORT ABSTRACT

Adsorption technique for wastewater treatment is considered to be the most economically feasible method. Various literatures reported the removal of dyes, heavy metals, etc., by adsorbents such as activated carbon, fly ash, fruit peels, polymeric adsorbents, clay materials, etc. Removal of metal ions and dyes by functionalized polymer like amine groups have been found to be one of the most efficient functional groups for adsorption in which the mechanisms have been attributed to the formation of complexes between the amine groups present on the adsorbents and the adsorbates to be removed.

The objective of the thesis was to investigate anionic dyes removal by two amine coated polymer – a) AFC-silica (aniline formaldehyde coated silica gel) and b) PANI-jute (short chain polyaniline coated jute fiber) and to synthesize a new support less amine based polymer (modified-AFC) with detail characterization and study the removal conditions of heavy metals from very dilute solution. Electrostatic attraction with protonated amine group and hydrophobic-hydrophobic interaction and hydrogen bonding were responsible for dye uptake besides which dye molecular weight was also found to play an important role. The support less amine polymer (modified-AFC) was powdered mesoporous material with round shaped clusters. Batch adsorption experiments of chromium and mercury in single system and lead, coper and chromium in multicomponent system was carried out from aqueous solution under operating conditions. Ion exchange as well as redox interaction between chromate ion and protonated amine group of the polymer was found to be the key factor for chromium adsorption. The residual concentration of total chromium (1.74 mg/L) was found within the discharge limit (2 mg/L) of wastewater which supports the adsorbent application in real wastewater treatment. For mercury removal interaction between protonated amine group and anionic species of mercury was the main adsorption mechanism. In multicomponent metal system adsorption due to the coordinate bond between metal ions and nitrogen present in amine group of modified-AFC was the main factor for the removal mixed metals. Finally, the results obtained from this research work gave an insight view of an efficient amine based polymer with and without any supporting material as a high potential adsorbent.