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Factors affecting the adsorption of Pb and Cu ions on to granular activated carbon

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Adsorption of Pb and Cu ions from aqueous solutions onto granular activated carbon was studied. Batch experiments showed that the sorption process was rapid and pH dependent. Highest metal uptake was recorded above solution pH 5. Initial rapid adsorption followed by a slow adsorption was observed for both Pb and Cu. Pb showed higher adsorption rate compared to Cu. The adsorption process conformed to the Freundlich and Langmuir isotherms. Langmuir monolayer adsorption capacities of 28 and 19 mg/g were observed at 22 °C for Pb and Cu respectively. The adsorbent to solution ratio and the metal ion concentration in the solution affects the degree of adsorption. Higher percent of metal removal were observed at high adsorbent doses due to the increase in number of adsorption sites or surface area with the weight of adsorbent. Minimum amount of adsorbent required for 99% removal of Pb and Cu from a 200 ppm solution were 8 and 15 g/L respectively. Decrease in

activated carbon particle size led to an increase in the sorption of metal ions and this could be explained by an increase in surface area and hence binding sites. Increase in the total metal uptake was observed when both Cu and Pb ions are present in the solution. The affinity of activated carbon for Pb was greater than Cu under all the experimental conditions tested. Breakthrough curves were obtained from fixed bed column studies and adsorption capacities were lower compared to batch adsorption. For 100 ppm metal concentrations, fixed bed column adsorption capacities for Pb and Cu were 19 and 8 mg/g respectively.

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