

Optimum Conditions for Adsorption of Aqueous Manganese (II) by Bamboo Wood Based Activated Carbon

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The presence of excessive amounts of Manganese in water creates substantial issues both in health and industrial sectors. Activated carbon is being used extensively in the remediation of contaminated water, as an effective and economically viable solution. This study was conducted to examine the optimum conditions for the adsorption of Mn (II) onto activated carbon derived from Bamboo wood. Bamboo Wood Activated Carbon (BAC) was prepared by chemical activation by impregnation with potassium hydroxide (KOH) at 1:1 ratio followed by pyrolysis at 800 °C for 2 hours. The estimated cost of BAC production was 0.26 US\$/kg. Batch adsorption studies were conducted to investigate the influence of contact time, pH, and adsorbent dose on the adsorption process while using Commercial Activated Carbon (CAC) as a reference. Both BAC and CAC have obtained the maximum removal efficiency (equilibrium) by 5 hours of contact time with 50.3% and 95.0%, respectively where the saturation of adsorption sites obtained. The optimum removal efficiency (RE) of Mn (II) was observed at pH 6 for BAC and CAC, which is 58.0% and 87.0%, respectively while RE of BAC was 57.0% and RE for CAC was 91.0% at pH 7. Although it showed highest REs (59.0% for BAC and 99.0% for CAC) at pH 9 but this was neglected since Mn (II) removal occurs due to precipitation at this condition. The highest RE showed at adsorbent dose of 5.0 g/L for BAC (89.0%) and 7.0 g/L for CAC (98.0%) for the study. Accordingly, it can be concluded that the aforementioned optimum conditions could be used for effective remediation of Mn (II) through adsorption onto BAC with lesser production cost than CAC (1 US\$/kg). The results from the study can be applied for optimizing an isotherm model for the adsorption of Mn (II) onto BAC and can be extended for increasing the Mn (II) removal efficiency and adsorption capacity by using different activating agents and activating temperatures.

Keywords: Manganese, Bamboo, Activated carbon, Pyrolysis, Optimum conditions