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Performance of Thermally Activated Laterite Soil as Adsorbent for the Removal of Chromium and Copper

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Abstract

The presence of heavy metals in the environment is a major cause of concern due to its negative impact on environment and human health. Adsorption has been proven to be one of the best options for pollution reduction in water, thus the use of thermally activated laterite soil for removal of Chromium (VI) and Copper ions from aqueous solutions was examined in this study. Two different laterite grain sizes of thermally activated laterite soil were used in the sorption experiment to remove the above mentioned ions from synthetic wastewater under laboratory conditions. The soil was gathered using the auger drilling method in Sri Lanka's Western Province. The excess moisture content in the soil samples was removed by air drying it for 48 hours before crushing them to get powdered material (2 mm and 0.5 mm). Thermally activated soil samples were prepared by heating laterite in a muffle furnace for 3 hours at 100° C, 200° C, 300° C, and 400° C. In order to determine the optimal adsorption conditions of chromium and copper ions into laterite soil, batch experiments were conducted at room temperature and natural pH. Based on the results of studies, thermally activated soil under 200° C temperatures for both 2 mm and 0.5 mm grain sizes gave maximum removal efficiencies for Chromium and Copper ions. The optimal contact time for 2 mm and 0.5 mm grain sizes for Chromium and Copper ions removal were around 20 minutes. Maximum removal efficiencies of Chromium and Copper were identified at 0.1 g of optimal soil dosage for 2 mm and 0.5 mm grain sizes. The results revealed that, thermal activation of laterite could give the considerable removal efficiencies for Chromium and Copper ions removal from water.

Keywords: Adsorption, Activated laterite, Chromium, Copper, Optimum time