

Abstract

The demand for clean water is on the increase as the population increases. One of the ways to address the water shortage is to treat the polluted water through removal of the contaminants. The use of adsorbents for pollutant removal is one of the promising methods. Seaweed is an aquatic plant and its sorption ability for selected metals in water was investigated in this study. We report the performance of the seaweed (*Caulerpa serrulata*) before and after modification with ethylenediamine (EDA), on adsorption of copper, lead and cadmium in aqueous solution. The adsorption capacities for Cu, Cd and Pb were 5.27 mg g^{-1} , 2.12 mg g^{-1} and 2.16 mg g^{-1} , respectively, with the EDA-modified seaweed, and 3.29 mg g^{-1} , 4.57 mg g^{-1} and 1.06 mg g^{-1} , with the unmodified weed, respectively. The pH for maximum adsorption was found to be within the range of pH 4–pH 6. In a separate investigation, it was found that 0.1 g of dried seaweed leached 20 mg of dissolved organic carbon (DOC) using 100 ml of distilled-deionised water. The resulting solution was green. The leaching phenomenon contributes to secondary pollution. Modification of the seaweed with EDA reduced the DOC content by half (50%) and also removed the green colouration. Kinetic studies showed that the adsorbent was able to take up to 95% of the metals (in synthetic standard solutions) in less than 10 min. The adsorbed metals were then stripped using a solution of 0.5 M HNO_3 indicating that the adsorbent can be regenerated. In addition, the study revealed that modification improved the thermal stability of the adsorbent such that even when the temperature was raised to $1000 \text{ }^\circ\text{C}$, more than 80% (compared to <50% for unmodified weed) of the modified adsorbent was not degraded, indicating that modification had a significant influence on the thermal stability of seaweed. The modified seaweed has been shown to have great potential for the removal of metals and DOC in polluted water. The modified adsorbent can therefore be applied for the removal of metals in polluted waters hence suitable for treatment of water for domestic consumption at a point of use.