Applicability of Grumusol Soil to Remove Cadmium from Textile Wastewater through Adsorption

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Heavy metals are well-known environmental pollutants. Today, it has become a serious problem in most of the countries in the world including Sri Lanka. The industrial sector can be considered as the major source of heavy metal pollution and in Sri Lanka, the textile industry has received a significant place. The processes like dyeing and finishing in textile manufacturing result in adding heavy metals into its wastewater. This generated wastewater typically contains environmentally harmful heavy metals like Cadmium. Failing to remove them properly will lead to accumulating them in surface water bodies and ultimately causing severe problems for human and aquatic ecosystems. Different methods have been tested for their suitability in removing heavy metals from wastewater amongst adsorption that has received much attention. For a country like Sri Lanka however, investigation of an economical, inexpensive, and safe method with having higher removal efficiencies is an essential and timely matter. The grumusol soil which can be easily found in Jaffna and Mannar districts in Sri Lanka has shown some special characteristics of a good adsorbent. The high cation exchange capacity, high clay fraction, high organic matter content, swelling and shrinkage properties, and the 2:1 clay mineral type bear evidence that it is worth to investigate the adsorption ability of grumusol soil. The primary objective of this study was to investigate the applicability of grumusol soil in removing heavy metals from aqueous solutions. In this study, cadmium (2^+) ion was used as the selected heavy metal and the textile wastewater was used to check the adsorption ability of grumusol soil to remove Cd^{2+}. The equilibrium time and effect of pH were investigated using the batch method. The results indicated that grumusol soil can adsorb cadmium ions with higher efficiency. The reaction is pH-dependent and the adsorption capacity of the grumusol soil increases with the increment of pH from 2 to 7 and maximizes at pH 10. The highest removal efficiency of 97.66% was recorded at pH 10 during the optimum equilibrium time of 6 hours.

Keywords: Grumusol soil, Heavy metal pollution, Cadmium, Adsorption, Textile wastewater