ADSORPTION OF NI (II) METAL ION FROM AQUEOUS SOLUTION BY USING LEUCAENA LEUCOCEPHALA PODS

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ABSTRACT

Removal of nickel is focused since the presence of nickel in wastewater or aqueous solution becomes harmful to human health and environment at a high level of nickel uptake. The adsorptive removal of Ni (II) metal ion was studied using modified *Leucaena leucocephala* pod adsorbent which is an economic agricultural waste. The characterization of *Leucaena leucocephala* pod adsorbent were evaluated by Fourier Transform Infrared (FT-IR), Thermogravimetric Analysis (TGA), and X-ray Fluoresence (XRF). Effects of various parameters such as pH, contact time and adsorbent dose on the adsorption percentage and capacity of Ni (II) metal ion have been investigated. The results show that the point zero charge of the adsorbent was identified at pH 6. The maximum adsorption of Ni (II) ions on *Leucaena leucocephala* pod was 89.7% at pH 8. The amount of Ni (II) metal adsorbed per unit weight of adsorbent increases with time and reach equilibrium after 160 minutes of shaking time. 0.25 g of adsorbent dosage was the most optimum and economical for the adsorption of Ni (II) heavy metal. The major functional groups involved in the adsorption process were identified as hydroxyl, ether and C-O-C as revealed by the FT-IR analysis. The chemically treated adsorbent demonstrated a potential application for efficient removal of Ni (II) ions from aqueous solution and also industrial wastewater.

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CHAPTER 1: INTRODUCTION

1.1 Background of research

Nowadays, the discharge of the industrial effluents becomes a major environmental problem because the discharge is mainly contained toxic heavy metals, organic and also inorganic materials. The pollution of water bodies and land is mainly caused by the unmethodical dumping of wastes either directly or indirectly into the river water due to the massive growth of the industrial sector [1]. Generally, the characteristics or properties of heavy metals found in the industrial effluent are cannot be decomposed by bacteria and are soluble in aqueous solution. The removal of heavy metals such as mercury, gold, tin, nickel, vanadium, lead, titanium, iron, manganese, lead, cobalt, zinc, etc., from the effluent wastewater from the industrial and ground source, is a matter that is taken into serious considerations nowadays. As these metals found in water are toxic to human and environment, the heavy metals should be removed from the water, which is an essential and challenging work to be done [2]. The World Bank has estimated that the waste generation from urban cities in Asia ranges from 450000 to 760000 tonnes/day and contributed about an average of 0.45 kg/capita/day [3]. There is an estimated that the total waste generation by Malaysia consists of 61% of agricultural waste, 26% of hazardous waste, 12% of municipal solid waste and 1% of electronic waste [4].

In this study, removal of nickel is focused since the presence of nickel in wastewater or aqueous solution becomes harmful to human health and environment at a high level of nickel uptake. Nickel is one of the highest priority toxic metal exists in water that should be properly removed. Nickel (II) metal concentration of 0.0001mg/L will fatal and can cause a serious case of pollution and illness to the human body. Nickel sources are mainly come from natural sources and also anthropogenic activity, and is widely distributed into the environment in either from mobile or stationary sources, which present in water bodies, oil, biological matter, and environment [5]. Generally, tobacco, stainless steel kitchen utensils, dental or inexpensive jewelry, contributed to the environmental sources of nickel, while the examples of natural sources of nickel are vegetation, volcanic eruptions, forest blazes. Nickel is essential to the human body at trace amount, however, at above of 250