ADSORPTION OF Ni(II) FROM AQUEOUS SOLUTION ONTO CITRIC ACID MODIFIED ALOE *VERA* (*Barbadensis miller)* LEAF POWDER

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ABSTRACT

ADSORPTION OF Ni(II) FROM AQUEOUS SOLUTION ONTO CITRIC ACID MODIFIED ALOE *VERA* (*Barbadensis miller)* LEAF POWDER

This research investigated the application of biosorbent derived from citric acid modified Aloe *Vera* (*Barbadensis miller*) powder (CAALVP) to adsorb cations Ni(II) from aqueous solutions. The biosorbent were characterized by spectroscopic and quantitative analysis. Chemical treatment had successfully changed the physicochemical characteristics of biosorbent such as pHslurry and pHpzc. Elucidation of chemical characteristics of biosorbent surface by Fourier Transfer Infrared (FTIR) spectroscopy reveal different types of functional groups. The performance of biosorbent was affected by pH, biosorbent dosage, initial concentration of the adsorbent and contact time. The adsorption of Ni(II) on biosorbent were best fitted to pseudo-second order kinetic models ($R^2 > 0.98$) and Freundlich isotherm model ($R^2 > 0.98$). However, for Langmuir isotherm, there was only slightly differences between adsorption capacities experimental and calculated which were 37.774 and 48.648 respectively. Meanwhile, for Freundlich there was huge differences between adsorption capacities experimental and calculated which were 39.938 and 8.79 respectively. The best pH and adsorbent dosage for this system were pH 6 and 0.10 g respectively.

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CHAPTER 1

INTRODUCTION

1.1 Background of the study

The term “heavy metal” is generally applied to a class of metals/metalloids having density more than 5 g/cm3 and atomic number greater than 20 (Raut *et al*., 2012). The existence of heavy metals in the environment may arise from natural and anthropogenic sources. Serious health effects can be caused by heavy metal, including growth retardation, organ damage, cancer, nervous system damage and in extreme case, death (Borba *et al*., 2006).

One of the metal pollutants in the water and environments is Nickel (Ni). The discharge of water effluent rich in nickel ions into water bodies increase due to rapid development of electronic industry (Hu *et al*., 2018). Since the pollution of heavy metals especially nickel ion into water may arise from natural and anthropogenic sources, the complete removal of nickel ions from the water is almost impossible with current technology. Industries such as stainless steels manufacturing, coins, super alloys, and batteries release high concentration of Ni(II) and cause environmental pollution. This situation may also affect human being because the released Ni(II) will flow