REMOVAL OF NICKEL (II) USING MODIFIED SPENT MUSHROOM WASTE OF *PLEUROTUS OSTREATUS*

AINI SYAHIRAH BINTI ABD GHANI

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ABSTRACT

This study investigates $CaCO_3$ modified spent mushroom waste of *Pleurotus ostreatus* biosorbent has the potential as environmetal friendly and cost-effective biosorbent for the biosorption of nickel (II) from aqueous solution. The effect of parameters of biosorbent weight, initial pH, contact time, initial nickel (II) concentration and temperature were carried out. The physical and chemical properties of the biosorbent were investigated by analytical method of SEM/EDX, FTIR and pH_{pzc} analysis. At 50 % removal from 50 mg/L of nickel (II) concentration, 0.09 g biosorbent weight was determined. The optimum initial pH and contact time were at unadjusted pH 5.0 and 30 minutes, respectively. The characterization by SEM analysis showed the 'muddy-like' smooth surface was formed after the biosorption due to the nickel (II) deposited on the modified biosorbent surface. From FTIR analysis, hydroxyl, carboxylic acid and ester functional groups were involved in this biosorption study. In addition, pH 7.5 was identified as point of zero charge for $CaCO_3$ modified spent mushroom waste of *Pleurotus ostreatus* biosorbent in pH_{pzc} analysis. In this study, it concludes that $CaCO_3$ modified spent mushroom waste of *Pleurotus ostreatus* is an effective and low cost biosorbent for nickel (II) removal from aqueous solution, especially in low concentration wastewater.

CHAPTER 1

INTRODUCTION

1.1 Background and problem statement

Metals pollution is a threat to human and environment due to its harmful effects. Metals such as copper, iron, manganese, cobalt and zinc at low concentrations are classified as vital nutrients for the growth of organisms but lethal at high concentrations. This is contrast for some other metals such as cadmium, mercury and lead which are highly toxic even though at low concentrations. Rapid industrial development in mining, metallurgy, electroplating and metal surface treatmenting has been identified as the sources of the pollution. This is due to improper treatment and discharge of wastewater containing metals into the environment either directly or indirectly (Nagy *et al.,* 2013). The consumption of polluted water by living organisms causes serious diseases on organisms and degradation of environment. Thus, the removal of metals from industrial wastewater are prominent in order to eliminate the impacts to the human, environment as well as in comply with the regulations stated by the Department of Environment.

Several conventional techniques have been proposed to remove metals from industrial wastewater. One of the most applied and popular technique used nowadays is activated carbon adsorption. It is effective in removing metals from aqueous solution but this technique is very high cost due to expensive materials and equipment used (Hashem *et al.*, 2013). Therefore, this condition