BIOSORPTION PROPERTY OF MODIFIED AND UNMODIFIED OF HYBRID BIOSORBENT OF MANGROVE BARK AND LIGNOCELLULOSIC (OIL PALM FIBER) TOWARD HEAVY METALS

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Dengan hormatnya perkara di atas adalah rujuk.

2.   Sukacita dimaklumkan pihak Universiti telah meluluskan bagi membiayai cadangan penyelidikan Prof Madya/Dr/Tuan/Puan di bawah Dana Kecemerlangan UiTM Sarawak 2016.

3.   Pihak Prof Madya/Dr/Tuan/Puan adalah diminta untuk mengisi borang setuju terima projek penyelidikan dan mendaftarkan penyelidikan ini ke dalam Sistem PuTras sekurang-kurangnya 14 hari selepas daripada tarikh surat ini. Sila rujuk ke pejabat RMU UiTM Sarawak bagi tatacara untuk pengurusan projek.

Sekian, harap maklum.

"SELAMAT MENJALANKAN PENYELIDIKAN DENGAN JAYANYA"

Yang benar

PROF. DATO DR JAMIL HJ HAMALI
Rektor

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ABSTRACT

Chemical water pollution in water bodies has trigger and create awareness among researchers on health effect of heavy metals toward living organisms and how to control chemical pollution from worsening. This pollution mainly comes from the industrial wastewaters that are discharged without being treated. Besides, due to the expensive material of conventional method, it is not suitable to be used to treat heavy metals in long term, however by using biomass as an adsorbent; it is cheaper and eco-environmental due to abundant resources of agricultural wastes. In this research, two types of biomass were used as biosorbenst, which were hybridized together to form hybrid biosorbent (HB): oil palm mesocarp fiber (OPMF) *(Elaesis guineensis sp.)* and mangrove bark (MB) *(Rhizophora apiculate sp.)*. The similarity between these biomasses is they can absorb multiple heavy metal ions (Cr, Cu, Ni, and Pb) at one time. Thus, by hybridizing these biosorbents, the adsorption capacity can be maximized compared with single biosorbent. The adsorption capacity was also investigated based on four parameters namely contact time, initial concentration, ratio/dosage and pH values. It was found that the adsorption capacity of HB was higher than OPMF and MB; and the results revealed that metals adsorption was in the order: $Pb^{2+} > Cu^{2+} > Ni^{2+} > Cr^{2+}$.

CHAPTER 1

INTRODUCTION

1.1   Environmental Pollution

Pollution is defined as a contamination that can be. in the form of chemical, physical or biological substances that are present in the environment (Hogan and Monosson, 2010; Shalaby, 2011). Furthermore, the large growth of human population is a major factor that leads to pollution of environment such as air, water, and noise pollution (Hogan and Monosson, 2010). Water pollution is one of the types of pollutions where the sources are quite similar with the other pollutions however the most significant source is an untreated sewage that can cause the formation of suspended solids and a decrease of dissolved oxygen due to the increase in population of microbes (Hogan and Monosson, 2010).

Besides, water pollutants can be divided into two types which are chemical and physical water pollutants. Hogan and McGinley (2012) stated that chemical water pollutants are produced from two sources which are pollutants that are flowing above and underground storage; and agriculture to intercourses. Meanwhile, physical water pollutant is based on the runoff of the sediment from agriculture, deforestation and discard of the rubbish (Hogan and McGinley, 2012). Moreover, water is also being polluted with heavy metals pollution (Hogan and Monosson, 2010; Volesky, 2001) and biodegradable organic materials with significant amount of inorganic matters (Shalaby, 2011) and if emitted into environment can pose a health hazard or harm and death to living organisms including humans (Naja and Volesky, 2011). The risk of heavy metal that threatens human health even in trace amount of contaminants has led to raise the attention of the researchers (Wang and Chen, 2014; Zhang et al., 2016; Demirbas, 2008; Zouboulis et al., 2004). In the meantime, heavy metal concentration must be minimized to the legalized limit before releasing into water source in order to reduce hazard to living things and ecology (Fuadi et al., 2014). For example one of carcinogenic heavy metal such as nickel can cause crucial damage to lungs and kidneys which lead to cancer and skin dermatitis (Syed-Hassan et al., 2014); while cadmium can cause kidney failure, renal ailment, high blood pressure, bone brittleness, devastation of red blood cells, liver damage and lung failure (Iqbal et al., 2007; Abia and Asuquo, 2007). As for zinc (Zn) and copper (Cu), these heavy metals are very toxic at higher concentration meanwhile lead (Pb), nickel (Ni), mercury (Hg) and cadmium (Cd) are found to have a

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