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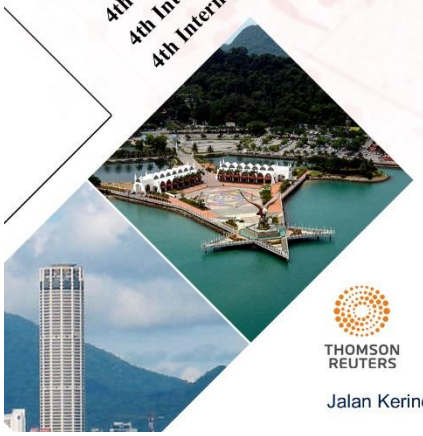

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Immobilization of Chaetoceros Sp. Biomass with Silica-Fe_3O_4 Coating and Adsorption Studies Towards Cu (II) Ion Solution

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Abstract:

Adsorbent synthesis from *Chaetoceros* sp. (Brown algae) biomass with silica-magnetite coating technique (ASMC) and without magnetite (ASC) has been done through the sol-gel process. The both adsorbents were characterized by an infrared spectrophotometer (IR), X-Ray diffraction (XRD) and scanning electron microscopy (SEM). The primary objective of this study was to study the adsorption capacity of the material synthesized algae biomass *Chaetoceros* sp. by coating silica-magnetite, the Cu(II) ion in the singular and the competition with metal ions such as Ni(II), Zn(II), Cd(II) and Pb(II) ion as a pair ion (binary system) in the solution. The adsorption process of Cu(II) ion was performed in a single and binary systems using batch method. Interaction of Cu (II) ion with the ASC and ASMC was studied in the pH range of 2-8. Effect of pH interaction of Cu (II) ion in solution with ASC and ASMC (Figure 1) showed that the adsorption of Cu (II) ion was optimum at pH 6 with the percentage of Cu (II) ion adsorbed on the ASC and ASMC respectively by 80 and 97 % [1-2]. Effect of interaction time of Cu(II) ion on the ASC and the ASMC takes place relatively quickly. In the first 15 minutes, the adsorption increased very sharply, after 15 minutes of the second, there was a slight increase in Cu(II) ion adsorbed and achieve constant at 60 minutes. At this stage, the adsorption process is estimated to have reached equilibrium and extra time did not give rise to the amount of metal ions adsorbed significantly [3].The Adsorption data of Cu(II) ion on the ASC and ASMC within a single system follows the pseudo kinetic model of order 2 with the adsorption rate of Cu(II) ion on the ASMC faster than the ASC. The adsorption isotherm model of Cu(II) ion on the ASC and ASMC tend to follow Langmuir adsorption isotherm model with adsorption capacity of respectively 57.77 and 105.91 mg g^{-1}. From the data competition of Cu(II) ion with ion pair of Ni(II), Zn(II), Cd(II) and Pb(II) in solution (Figure 2) can be observed that in general the ASMC adsorbent can adsorb all metal ions with a fairly high percentage, although between the metal ion pairs competed have different sizes ionic radii. Differences radius of metal ions which competed in the adsorption process is one of the determining factors of the selectivity of an adsorbent to metal ions [4]. This indicates that the ASMC is not selective for the metal ions competed. Thus, it can be stated that the ASMC adsorbent can be used in

the treatment of waste containing a mixture of multi-component metal because it is not selective for the particular metal.

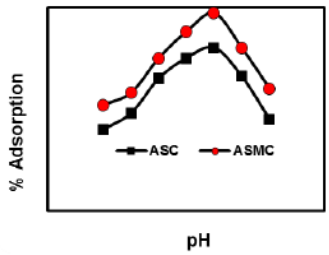

Fig. 1: Percentage of Cu(II) ion adsorbed on ASC and ASMC material at pH interval of 2-8 (Concentration of 100 mg L^{-1} and temperature of 27°C).

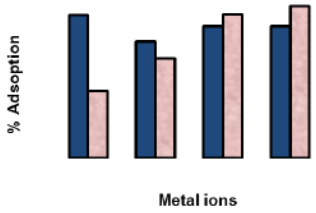

Fig. 2: Adsorption competition of Cu(II) ion to ions of Ni(II), Zn(II), Cd(II), and Pb(II) in solution on ASMC.

Keywords: adsorption capacity, Chaetoceros sp., heavy metals, silica-magnetite coating.

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