Bagasse-Based Activated Carbon as Effective Adsorbent for Heavy Metal Contamination from Industrial Activities (Case Study: Gold Mining Area in Mandor River, West Kalimantan)

Hartono, Hansen
Dewi, Shinta

Mandor River water as the main water source in West Kalimantan is not feasible to be used because it has been contaminated by Hg2+ (0.0095 ppm) from gold mining activities and Fe3+ (2.722 ppm) caused by peat moss water in Kalimantan. Those concentrations are 9 times of permitted thresholds. Thus, authors propose the use of bagasse-based activated carbon in order to decrease Hg2+ and Fe3+ concentrations. In this research, the activated carbon was made by pyrolisis of prepared and dried bagasse in furnace at 600oC for 1.5 hours. Physical activation was done by heating at 550oC for 6 hours, while chemical activation was through immersions in H2SO4 or NaOH. Bagasse-based activated carbon characterization showed that alkalic activation gave the best characteristics, e.g., ash content 1.09%, moisture content 0.706%, iodine number 880 mg/g and surface area 1,057 m2/g. The adsorption effectiveness of Hg2+ and Fe3+ was examined by analyzing various parameters including pH, contact time, adsorbent dosage and stirring speed. In addition, the adsorption kinetics of those ions was also studied. Optimum conditions of both ions adsorption were at pH 6.0, contact time 90 minutes, adsorbent dosage 3 g and stirring speed 100 rpm. Furthermore, the adsorption kinetics of Hg2+ and Fe3+ followed the first kinetics order with adsorption rate constant 0.023 minute-1. Therefore, bagasse-based activated carbon could be used to decrease Hg2+ and Fe3+ concentrations 97.19% and 96.66% so they were below the thresholds. In conclusion, it is very potential to be used in reducing heavy metal wastes from industries. Keywords: Bagasse, Adsorbent, Heavy Metals, Activated Carbon