The Use of Modified Natural Zeolite from Gunung Kidul, Yogyakarta, Indonesia to Reduce The Contamination of Copper, Zinc, and Cadmium in Waste Water of Electroplating Industry

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The aim of this study was first to evaluate the time required to achieve equilibrium in the adsorption process of Cu$^{2+}$, Zn$^{2+}$, and Cd$^{2+}$ on the natural zeolite from Gunung Kidul, Yogyakarta, Indonesia, that had been modified using anorganic acid, HCl, with the concentration of 1 N. The second, was to measure the maximum concentration of these ions that could be adsorbed per unit mass of adsorben (adsorption capacity of that adsorbent), and the third, was to determine whether the adsorption process of these ions were good fit to the regression equation of Freundlich or Langmuir model of adsorption.

The results of this research demonstrated that the adsorption equilibrium can be attained after 60 minutes of time, then all the evaluation needed to establish the adsorption capacity or model of adsorption must be measured after such period of time.

It was also shown from the data and the figures obtained that the adsorption capacity of Cu$^{2+}$, Zn$^{2+}$, and Cd$^{2+}$ on that modified natural zeolite was 4.81 ± 0.03 mg/g, 4.01 ± 0.05 mg/g, and 4.51 ± 0.03 mg/g, respectively, and the adsorption processes of those three ions were good fit to the regression equation of Freundlich model of adsorption.

Comparing X-ray diffraction pattern of natural zeolite used and that of standard zeolite, it was obvious that the natural zeolite from Gunung Kidul, Yogyakarta, Indonesia, is zeolite of mordenite type. It was also demonstrated from the X-ray diffraction patterns that treatment with HCl 1 N did not destroy the crystalline structure of zeolite.

It was also clear from the infrared spectra that treatment with HCl 1 N did not change the functional group of the zeolite used.