

ABSTRAK

PENGARUH KOMPOSISI SILIKON DAN ALUMINIUM DEBU TANAH DALAM DAYA ADSORPSINYA TERHADAP METILEN BIRU

Debu tanah memiliki kemampuan mengadsorpsi karena adanya mineral liat yaitu silika, silikat dan aluminosilikat. Tujuan penelitian: 1) menentukan kandungan kimia yang terdapat pada debu tanah di berbagai wilayah, 2) menjelaskan korelasi komposisi silikon dan aluminium dalam daya adsorpsinya terhadap metilen biru, 3) menentukan kondisi optimum dalam proses adsorpsi, 4) menentukan mekanisme penyerapan zat warna metilen biru berdasarkan model isoterm adsorpsi. Kandungan kimianya diketahui dari karakterisasi *X-ray Fluorescence (XRF)*. Daya adsorpsi dan kondisi optimum diperoleh berdasarkan hasil interaksi adsorben dan adsorbat menggunakan instrumen Spektrofotometer *Ultraviolet* dan Sinar Tampak menggunakan metode *batch* dengan sampel yang paling besar daya adsorpsinya, optimasi yang dilakukan di antaranya: pH, waktu kontak, massa adsorben dan optimasi konsentrasi adsorbat. Mekanisme adsorpsi diketahui berdasarkan perhitungan isoterm adsorpsi model Freundlich dan Langmuir. Debu diperoleh dari dinding bangunan tiga wilayah, yakni Kapur, Bukit/Gunung, dan Pantai. Preparasi dilakukan dengan pemanasan pada suhu 120°C selama 3 jam. Berdasarkan hasil penelitian kandungan kimianya secara umum didominasi silikon (Si), aluminium (Al), kalsium (Ca) dan besi (Fe). Ciri khas wilayah Kapur tinggi kalsium, Bukit/Gunung tinggi sulfur, fosfor, dan air, Pantai tinggi klor, kalium, natrium, dan magnesium. Korelasi komposisi silikon dan aluminium dalam daya adsorpsinya yaitu semakin tinggi selisih kadar total silikon terhadap kadar total aluminium maka daya adsorpsi terhadap metilen biru semakin tinggi. Kapasitas adsorpsi pada kondisi optimum yaitu waktu kontak 5 menit, pH 6, massa adsorben 0,01 gram, dan konsentrasi larutan 50 ppm. Mekanisme adsorpsi metilen biru mengikuti model Isoterm Freundlich dan Langmuir.

Kata-kata kunci: debu tanah; isoterm adsorpsi; metilen biru; Si-Al; dan *batch*.

ABSTRACT

THE INFLUENCE OF SILICON COMPOSITION AND ALUMINUM OF SOIL DUST IN ADSORPTION POWER TO METHYLENE BLUE

Soil dust has adsorption capability sourced from silica minerals, silicates, and aluminosilicates. This research aims 1) to determine the chemical content of soil dust in various regions, 2) to explain the correlation of silicone and aluminum compositions in its adsorption power to methylene blue colored solutions, 3) to know the optimum conditions (contact time, pH, adsorbent mass, adsorbate concentration) in adsorption process, and 4) to determine the methylene blue dye absorption mechanism based on the adsorption isotherm model. The dust is obtained from building walls of three regions, namely limestone, mountains, and beaches. In addition, the preparation was carried out by heating at 120 °C for 3 hours that has been characterized by X-ray Fluorescence (XRF) and measured absorption by Ultraviolet and UV-Vis spectrophotometers under batch method, the adsorption mechanism was known by Freundlich and Langmuir adsorption isotherm model. Eventually, the results showed that in general, the chemical content contained silicon (Si), aluminum (Al), calcium (Ca) and iron (Fe) characteristic of limestone, mountain, and coastal areas respectively containing calcium, (sulfur, phosphorus, and water), and salt formers (chlorine, potassium, sodium, magnesium), the higher silicon content to aluminum content, the higher adsorption capacity of methylene blue, the optimum condition of absorption by coastal dust occurs at 5 minutes contact time, pH 6, 0.01 gram of adsorbent mass, and 50 ppm solution concentration, methylene blue adsorption mechanism occurs physically and chemically follows Freundlich and Langmuir Isotherm model.

Keywords: soil dust; adsorption isotherm; methylene blue; Si-Al; and batches.