SINTESIS BIOCHAR OKARA TERAKTIVASI HCl DAN APLIKASINYA SEBAGAI ADSORBEN SENYAWA MALATHION

Zulfa Fitriana
21/480717/PA/20896

INTISARI

Sintesis biochar okara teraktivasi HCl dan aplikasinya sebagai adsorben senyawa malathion telah dilakukan. Penelitian ini dilakukan dengan tujuan untuk melakukan sintesis dan karakterisasi biochar okara teraktivasi HCl, menganalisis pengaruh variasi pH, massa, waktu kontak, konsentrasi, dan temperatur terhadap efektivitas adsorpsi, serta menerapkan metode regenerasi adsorben. Biochar-HCl disintesis melalui pengeringan dan proses pirolisis dari biomass okara, kemudian diaktivasi dengan HCl. Efektivitas adsorpsi malathion diuji dengan variasi parameter, serta dianalisis menggunakan model kinetika serta isoterm adsorpsi. Biochar-HCl sebelum dan sesudah adsorpsi dikarakterisasi dengan FT-IR, SSA, XRD, dan SEM.

Hasil dari penelitian ini menunjukkan bahwa biochar yang disintesis dari okara dan diaktivasi dengan HCl menunjukkan peningkatan kapasitas adsorpsi terhadap senyawa malathion. Hal ini disebabkan oleh perubahan signifikan pada morfologi dan komposisi permukaan biochar. Kondisi optimum untuk adsorpsi malathion diperoleh pada pH 8 dengan massa adsorben sebesar 15 mg, waktu kontak selama 45 menit, konsentrasi awal 40 ppm, dan suhu 30 °C. Proses ini mengikuti model kinetika difusi intrapartikel dan model isoterm Dubinin-Radushkevich dengan kapasitas adsorpsi sebesar 34,18 mg g^{-1}. Hasil regenerasi menunjukkan bahwa biochar okara tetap memiliki kapasitas adsorpsi yang baik setelah digunakan.

Kata kunci: adsorben, biochar, isoterm, malathion, optimum

SYNTHESIS OF HCl-ACTIVATED OKARA BIOCHAR AND ITS APPLICATION AS ADSORBENT FOR MALATHION COMPOUNDS

Zulfa Fitriana
21/480717/PA/20896

ABSTRACT

Synthesis of HCl-activated okara biochar and its application as adsorbent for malathion compounds has been carried out. This study was conducted with the aim of synthesis and characterization HCl-activated okara biochar, analyzing the effect of pH variation, mass, contact time, concentration, and temperature on adsorption effectiveness and, applying adsorbent regeneration methods. Biochar-HCl was synthesized through drying and pyrolysis process from okara biomass, then activated with HCl. The adsorption effectiveness og malathion was evaluated under various conditions, and kinetic and isotherm models. Biochar-HCl before and after adsorption were characterized by FT-IR, SSA, XRD, and SEM.

The results demonstrated that biochar synthesized from okara and activated with HCl showed an increased adsorption capacity for malathion compounds. This was due to significant changes in its morphology and composition of the biochar surface. The optimum condition for malathion adsorption was found at pH 8 with an adsorbent mass of 15 mg, contact time of 45 minutes, initial concentration of 40 ppm, and temperature of 30 °C. The adsorption process followed the intraparticle diffusion kinetic model and the Dubinin-Radushkevich isotherm model with an adsorption capacity of 34.18 mg g^{-1}. Furthermore, regeneration studies showed that the biochar retained good adsorption performance after reuse.

Keywords: adsorbent, biochar, isotherm, malathion, optimum