

ADSORPSI ION LOGAM Cd(II) DALAM AIR MENGGUNAKAN LIMBAH STIROFOAM NITRAT TERMAGNETISASI

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INTISARI

Telah dilakukan sintesis adsorben stirofoam ternitrasi dan termagnetisasi untuk penghilangan ion logam Cd(II) dalam air. Sintesis adsorben dilakukan dengan modifikasi stirofoam melalui proses nitration dan magnetisasi menggunakan campuran asam nitrat dan asam sulfat serta larutan Fe(II)/Fe(III) dalam kondisi basa sehingga terbentuk adsorben Sti-NO₂/Fe₃O₄. Karakterisasi adsorben dilakukan menggunakan instrumen FTIR, XRD, SEM, dan SEM-EDX. Pada adsorpsi ion logam Cd(II) dengan metode *batch*, dilakukan optimasi massa adsorben, pH larutan, waktu kontak, dan konsentrasi awal adsorbat serta penentuan kinetika dan isoterm adsorpsi.

Hasil karakterisasi menunjukkan bahwa melalui nitration dan magnetisasi stirofoam dihasilkan adsorben Sti-NO₂/Fe₃O₄ yang mampu mengadsorpsi ion logam Cd(II) dan mudah dipisahkan dengan batang magnet. Adsorben Sti-NO₂/Fe₃O₄ menghasilkan adsorpsi dan pemisahan yang maksimum dengan kapasitas adsorpsi sebesar 4,076 mg/g. Kondisi optimum adsorpsi ion logam Cd(II) 30 mg/L dalam 25 mL larutan oleh adsorben Sti-NO₂/Fe₃O₄ adalah pada pH 7, massa adsorben 20 mg, dan waktu kontak 45 menit. Adsorpsi ion logam Cd(II) oleh Sti-NO₂/Fe₃O₄ mengikuti kinetika orde dua semu Ho dan McKay dengan konstanta laju 0,1307 g/mg.menit dan isoterm adsorpsi mengikuti model isoterm Langmuir dengan konstanta Langmuir 0,2359 L/mg.

Kata kunci: adsorpsi, Fe₃O₄, ion Cd(II), nitration, stirofoam.

ADSORPTION OF Cd(II) METAL IONS FROM WATER USING MAGNETIZED NITRATE STYROFOAM WASTE

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ABSTRACT

Synthesis of nitrated and magnetized styrofoam adsorbents for removing Cd(II) metal ions in water has been carried out. The synthesis of Sti-NO₂/Fe₃O₄ adsorbent was done by modification of styrofoam through the nitration and magnetization process using a mixture of nitric acid, sulfuric acid, and Fe(II)/Fe(III) solution under alkaline conditions. The adsorbent was characterized using FTIR, XRD, SEM, and SEM-EDX instruments. The mass of the adsorbent, pH of the solution, contact time, and initial concentration of adsorbate was optimized in the adsorption of Cd(II) metal ions by batch technique. The adsorption kinetics and isotherms were also determined.

The characterization indicated that Sti-NO₂/Fe₃O₄ adsorbent was produced through nitration and magnetization of styrofoam, which could adsorb Cd(II) metal ions and was easily separated using a magnetic rod. The maximum adsorption and separation with an adsorption capacity of 4.076 mg/g were obtained. The optimum condition for the adsorption of 30 mg/L of Cd(II) metal ions in 25 mL solution by Sti-NO₂/Fe₃O₄ adsorbent was determined at pH 7, adsorbent mass of 20 mg, and contact time of 45 minutes. The adsorption of Cd(II) metal ions by Sti-NO₂/Fe₃O₄ obeyed Ho and McKay's pseudo-second-order kinetics with a rate constant of 0.1307 g/mg.min, and the adsorption isotherm was found to follow the Langmuir isotherm model with a constant of 0.2359 L/mg.

Keywords: adsorption, Cd(II) ions, Fe₃O₄, nitration, styrofoam.