

Sintesis karakterisasi dan aplikasi poli{(4-vinil piridin) KO (asam metakrilat)} sebagai adsorben selektif ion Pb²⁺ menggunakan teknik ion imprinted polymer = Synthesis characterization and application of poly{(4-vinyl pyridine)-co-(methacrylic acid)} as selective adsorbent for Pb²⁺ ion using ion imprinted polymer technique

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Abstrak

Imprinted polymer untuk ion Pb²⁺ (Pb-IIP) disintesis melalui proses self assembly antara monomer fungsional 4-vinil piridin dan asam metakrilat serta ion Pb²⁺ sebagai template. Kompleks template/monomer yang terbentuk dipolimerisasi menggunakan metode polimerisasi suspensi dengan pengikat silang etilen glikol dimetakrilat (EGDMA) dan inisiator 2,2'-azobis isobutyronitril (AIBN). Proses leaching menggunakan HNO₃ 0,5 M dilakukan pada Pb-IIP hasil sintesis untuk mengelusi ion Pb²⁺, sehingga didapatkan rongga spesifik yang berfungsi sebagai situs pengenalan. Keberhasilan sintesis polimer dianalisis menggunakan FTIR. Puncak gugus C=C ulur vinil pada panjang gelombang 1630 cm⁻¹ tidak muncul menandakan putusannya ikatan rangkap akibat adanya proses polimerisasi.

Hasil karakterisasi EDX menunjukkan bahwa pengompleksan dan pengelusian ion Pb²⁺ berhasil dilakukan yang dikonfirmasi dengan munculnya intensitas Pb sebelum dilakukan elusi dan tidak munculnya intensitas Pb setelah dilakukan elusi. Hasil karakterisasi menggunakan PSA menunjukkan distribusi ukuran partikel Pb-IIP yaitu 34,5m. Adsorben Pb-IIP diuji sifat adsorpsi serta desorpsinya dan diperoleh persen adsorpsi di atas 99% dan persen desorpsi sebesar 92,45%. Sebagai pembandingan, pada non imprinted polymer (NIP) diperoleh persen adsorpsi sebesar 21,63% dan persen desorpsi sebesar 52,57%. Pb-IIP memiliki persen adsorpsi yang lebih besar terhadap Pb²⁺ dibandingkan dengan ion logam lainnya yaitu Ni²⁺, Co²⁺, Cu²⁺, dan Fe³⁺. Kemampuan adsorpsi maksimum pada Pb-IIP dapat dicapai saat pH 7 dan waktu kontak 60 menit. Pb-IIP dapat diaplikasikan pada sampel air di lingkungan dengan % recovery sebesar 110%.

An imprinted polymer for Pb²⁺ ion (Pb-IIP) was synthesized by self-assembly method using 4-vinyl pyridine, methacrylic acid as functional monomer and Pb²⁺ ion as template. Template/monomer complex was polymerized using a suspension polymerization method with crosslinker ethylene glycol dimethacrylate (EGDMA) and initiator 2,2'-azobis isobutyronitrile (AIBN). Pb-IIP was leached using 0.5 M HNO₃ to remove Pb²⁺ ion that would produce the specific cavity as a recognition site. The success of synthesis was analyzed using FTIR resulting the absence of peak for C=C stretching at 1630 cm⁻¹ indicated the bond rupture due to the polymerization process.

EDX characterization indicated that complexing and leaching of Pb²⁺ ion were successfully confirmed by the appearance of Pb elements prior to elution and disappearance of Pb elements after elution. PSA characterization showed the particle size distribution of Pb-IIP was 34.5 m. Adsorption and desorption process were performed on Pb-IIP adsorbent obtained > 99% for adsorption and 92.45% for desorption. NIP adsorbent used for comparison with Pb-IIP resulting 21.63% for adsorption and 52.57% for desorption. Pb-IIP had a better adsorption towards Pb²⁺ compared with other metal ions such as Ni²⁺, Co²⁺, Cu²⁺, and Fe³⁺. The maximum adsorption capacity of Pb-IIP could be achieved when the pH was 7 and contact times was 60 minutes. Pb-IIP could be applied to environmental water samples resulting % recovery 110%.