

Pengembangan metode prakonsentrasi timbal dengan resin penukar ion dari ekstrak tanin daun akasia mangium (*acacia mangium willd*) = Development of lead preconcentration methods on ion exchanger resin with tannin acacia mangium extract (*acacia mangium willd*)

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Abstrak

Kandungan ion logam Timbal dalam air cenderung sangat rendah sehingga proses analisisnya memerlukan teknik prakonsentrasi menggunakan resin penukar ion. Penggunaan resin penukar ion dalam teknik prakonsentrasi memiliki kelebihan, diantaranya faktor kehilangan analit dapat diminimalkan dan jumlah resin yang digunakan sedikit dan ramah lingkungan. Pada penelitian ini, ekstrak tanin daun Akasia Mangium digunakan sebagai bahan baku pembuatan resin penukar ion. Reaksi polimerisasi ekstrak tanin dengan penambahan H₂SO₄ pekat dilakukan agar resin tidak mudah larut dalam air. Hasil polimerisasi ekstrak tanin PET dikarakterisasi secara kualitatif menggunakan spektroskopi Fourier Transform Infra Red FTIR dan kuantitatif dengan pengukuran Total Karbon Organik TOC . Untuk mengetahui kemampuannya sebagai resin penukar ion, PET diuji dengan parameter adsorpsi, pola isoterm adsorpsi, dan validasi metode analisis. Kapasitas adsorpsi optimum resin PET diperoleh sebesar 5,261 mg/g pada pH 7 dan waktu kontak 120 menit, sedangkan parameter retensi optimum diperoleh pada konsentrasi eluen HNO₃ 2 M dengan volume 5 mL. Isoterm adsorpsi yang sesuai untuk resin PET mengikuti isoterm Freundlich dengan nilai regresi 0,9919. Berdasarkan uji validasi metode analisis diperoleh nilai kebolehulangan dengan RSD sebesar 0,97 , linearitas R² 0,9986 pada rentang 0,25-100 ppm, sensitivitas sebesar 0,067 ppm, batas deteksi Limit of Detection/LOD sebesar 0,019 ppm dan recovery sebesar 102,3 -110,91 . Hasil uji sampel menunjukkan kadar Timbal di sungai Ciliwung sebesar 105-267 ppb.

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The heavy metal ions contained in water tend to be so low that the analysis process requires preconcentration techniques using ion exchange resins. The use of ion exchange resins in preconcentration techniques has advantages, such as factors for loss of analyte can be minimized and the amount of resin used is small and environmentally friendly. In this study, Acacia Mangium leaf tannin extract was used as the raw material for ion exchange resin production. The polymerization reaction of tannin extract with the addition of concentrated H₂SO₄ is done so that the resin is not easily soluble in water. Results from polymerization of tannin extract PET were characterized qualitatively using Fourier Transform Infra Red FTIR and quantitative spectroscopy with Total Organic Carbon TOC measurements. To find out its ability as ion exchange resin, PET was tested with adsorption parameters, adsorption isotherm patterns, and validation of analytical methods. The optimum adsorption capacity of PET resin was obtained at 5,261 mg g at pH 7 and contact time of 120 min, while the optimum retention parameter was obtained at eluent concentration of HNO₃ 2 M in 5 mL of volume. The adsorption isotherms suitable for PET resins that follow Freundlich isotherms with a regression value of 0.9919. Based on the validation test of the analysis method, the value of repeatability with RSD is 0.97 , the linearity of R² 0.9986 in the range of 0.25 100 ppm, the sensitivity of 0.067 ppm, the limit of detection Limit of Detection LOD of 0.019 ppm and the recovery of 102.3 110.91 . The result of the sample test shows that the Lead level in Ciliwung River is 105 267 ppb.