

**SINTESIS DAN UJI AKTIVITAS SENYAWA
C-4-HIDROKSI-3-METOKSIFENILKALIKS[4]PIROGALLOLARENA
SEBAGAI ADSORBEN LOGAM BERAT NIKEL DAN BESI**

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INTISARI

Sintesis senyawa turunan kaliks[4]pirogallolarena telah berhasil dilakukan dan diaplikasikan sebagai adsorben logam berat Ni(II) dan Fe(III). Penelitian ini bertujuan untuk melakukan sintesis senyawa C-4-hidroksi-3-metoksifenilkaliks[4]pirogallolarena (Pg4OH3OMe) dan mengetahui kemampuan senyawa tersebut sebagai adsorben logam Ni(II) dan Fe(III). Penelitian diawali dengan sintesis senyawa Pg4OH3OMe dengan mereaksikan pirogalol dan vanilin dalam suasana asam melalui penambahan HCl 37% dalam pelarut etanol. Sintesis dilakukan dengan metode refluks pada suhu 78 °C selama 24 jam. Senyawa hasil sintesis dilakukan karakterisasi dengan spektrometer FTIR, ¹H-NMR, ¹³C-NMR dan elemental analisis. Kemampuan adsorpsi senyawa Pg4OH3OMe terhadap logam Ni(II) dan Fe(III) dievaluasi melalui penentuan pH, waktu kontak dan konsentrasi awal optimum, sehingga dapat diketahui model kinetika adsorpsi dan isoterm adsorpsi senyawa Pg4OH3OMe.

Senyawa Pg4OH3OMe hasil sintesis diperoleh sebagai padatan berwarna merah muda dengan titik dekomposisi 307-310 °C dan rendemen sebesar 82,05%. Berdasarkan pada kajian adsorpsi diperoleh bahwa adsorpsi logam Ni(II) dan Fe(III) oleh senyawa Pg4OH3OMe memiliki kapasitas adsorpsi tertinggi pada pH 4 dan waktu pengadukan 90 menit sedangkan konsentrasi awal optimum adsorpsi logam Ni(II) dan Fe(III) berturut-turut adalah 160 dan 80 ppm. Proses adsorpsi logam Ni(II) dan Fe(III) mengikuti model kinetika orde kedua semu dan model isoterm Langmuir dengan kapasitas adsorpsi maksimum berturut-turut sebesar 6,63 dan 125 mg g⁻¹.

Kata kunci : C-4-hidroksi-3-metoksifenilkaliks[4]pirogallolarena, logam Ni(II), logam Fe(III), adsorpsi

SYNTHESIS AND APPLICATION OF C-4-HYDROXY-3-METHOXYPHENYLCALIX[4]PYROGALLOLARENE AS NICKEL AND IRON HEAVY METALS ADSORBENT

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ABSTRACT

The synthesis of C-4-hydroxy-3-methoxyphenylcalix[4]pyrogallolarene (Pg4OH3OMe) compound has been carried out and it has been applied as an adsorbent for Ni(II) and Fe(III) heavy metals. This research aims to synthesize Pg4OH3OMe compound and determine its ability as adsorbent for Ni(II) and Fe(III) heavy metals. This research was started with the synthesis of Pg4OH3OMe compound by reacting pyrogallol and vanillin under an acidic condition by the addition of HCl 37% in ethanol as the solvent. The synthesis was carried out through a reflux method at 78 °C for 20 hours. The synthesized compound was characterized by FTIR, ¹H-NMR, ¹³C-NMR and elemental analysis. The adsorption ability of Pg4OH3OMe compound for Ni(II) and Fe(III) was evaluated by determining the pH, contact time and optimum initial concentration thus, the adsorption kinetics and adsorption isotherm models of Pg4OH3OMe compound could be determined.

The synthesized Pg4OH3OMe compound was obtained as a pink solid with a decomposition point of 307-310 °C in 82.05% yield. Based on the adsorption study, it was found that Ni(II) and Fe(III) adsorption with Pg4OH3OMe compound had the highest adsorption capacity at pH 4 and a stirring time of 90 minutes while the optimum initial concentrations of Ni(II) and Fe(III) adsorption were 160 and 80 ppm, respectively. The adsorption process of Ni(II) and Fe(III) followed the pseudo second order kinetics and the Langmuir isotherm models with the maximum adsorption capacity of 6.63 and 125 mg g⁻¹, respectively.

Keyword : C-4-hydroxy-3-methoxyphenylcalix[4]pyrogallolarene, adsorption, Ni(II) metal, Fe(III) metal