

**SINTESIS C-4-ALILOKSI-3-METOKSIFENILKALIKS[4]
RESORSINARENA DARI VANILIN DAN APLIKASINYA SEBAGAI
ADSORBEN KATION LOGAM Pb(II)**

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INTISARI

Sintesis senyawa C-4-aliloksi-3-metoksifenilkaliks[4]resorsinarena berbahan dasar vanilin serta aplikasi senyawa tersebut sebagai adsorben kation logam Pb(II) telah dilakukan.

Sintesis senyawa C-4-aliloksi-3-metoksifenilkaliks[4]resorsinarena berbahan dasar vanilin dilakukan melalui 3 tahap reaksi. Tahap pertama adalah sintesis 3-bromo-1-propena dengan mereaksikan alil alkohol dengan asam bromida menggunakan katalis asam sulfat pekat. Senyawa alkena yang diperoleh berupa cairan tidak berwarna dan berbau menyengat dengan rendemen 46,14%. Tahap kedua adalah sintesis 4-aliloksi-3-metoksi benzaldehida dengan mereaksikan vanilin dan 3-bromo-1-propena dengan bantuan kalium karbonat dan pelarut aseton. Senyawa benzaldehida yang dihasilkan berupa cairan berwarna kuning kecoklatan dengan rendemen 77,08%. Tahap ketiga adalah mereaksikan 4-aliloksi-3-metoksibenzaldehida dan resorsinol dengan katalis asam klorida menghasilkan senyawa C-4-aliloksi-3-metoksifenilkaliks[4]resorsinarena. Hasil sintesis berupa padatan berwarna merah muda dengan rendemen 78,17% dan titik leleh lebih besar dari 200 °C. Elusidasi struktur produk menggunakan spectrometer IR, ¹H-NMR dan ¹³C-NMR.

Adsorpsi dilakukan dengan variasi keasaman larutan, waktu interaksi dan konsentrasi awal larutan. Kinetika adsorpsi dipelajari menggunakan kinetika Lagergren dan Ho, sedangkan isoterm adsorpsi dianalisis dengan persamaan Langmuir dan Freundlich. Data yang diperoleh menggambarkan kenaikan pH dan waktu interaksi meningkatkan jumlah logam teradsorpsi hingga mencapai kondisi optimum pada pH 4 dan waktu kontak 30 menit. Hasil kajian kinetika adsorpsi menunjukkan bahwa adsorpsi Pb(II) dengan adsorben C-4-aliloksi-3-metoksifenil kaliks[4]resorsinarena mengikuti model kinetika orde dua semu Ho dengan laju adsorpsi 1,176 g mg⁻¹ menit⁻¹. Kajian isoterm adsorpsi mengikuti isoterm adsorpsi Langmuir, dengan nilai konstanta keseimbangan (K) sebesar 7,283×10⁻⁵ L mol⁻¹, kapasitas maksimum (X_m) sebesar 1,538 mmol g⁻¹ serta energi adsorpsi sebesar 33,67 kJ mol⁻¹.

Katakunci : *kaliks[4]resorsinarena, vanilin, adsorpsi, Pb(II)*

SYNTHESIS OF C-4-ALLYLOXY-3-METHOXYPHENYLCALIX[4] RESORCINARENE FROM VANILLIN AND ITS APPLICATION AS ADSORBENT OF Pb(II) METAL CATION

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ABSTRACT

Synthesis of C-4-allyloxy-3-methoxyphenylcalix[4]resorcinarene from vanillin and its application as adsorbent for Pb(II) metal cation have been carried out.

Synthesis of C-4-allyloxy-3-methoxyphenylcalix[4]resorcinarene from vanillin was conducted in three steps. The first step was synthesis of 3-bromo-1-propene from allyl alcohol and bromide acid using concentrated sulphuric acid as catalyst. The alkene product was obtained as colorless liquid with pungent odor in 46.14% yield. The second step was synthesis of 4-allyloxy-3-methoxybenzaldehyde from vanillin and 3-bromo-1-propene using potassium carbonate in acetone. The benzaldehyde product was obtained as yellow-brownish liquid in 77.08% yield. The product obtained was then reacted with resorcinol in acidic condition to produce C-4-allyloxy-3-methoxyphenylcalix[4]resorcinarene. This product was obtained as pink solid in 78.17% yield having melting point of more than 200 °C. The structure elucidation of the product was performed by IR, ¹H-NMR dan ¹³C-NMR.

Adsorption experiments were carried out in batch sistem under variation of medium acidity, interaction time and initial metal concentration. Adsorption kinetic was studied using Lagergren and Ho equations, while adsorption isotherm was analyzed by Langmuir and Freundlich equations. The result showed that the amount of adsorbed metal increased with the increase of pH and interaction time until finally reached the optimum condition at pH 4 and at interaction time 30 minutes. The kinetic study showed that the adsorption of Pb(II) followed pseudo-second order of Ho with adsorption rate (k) of 1.176 g mg⁻¹ minute⁻¹. The isotherm study showed that the adsorption followed Langmuir isotherm model. The calculated equilibrium constant (K) was 7.283 × 10⁻⁵ L mol⁻¹, maximum adsorption capacity (X_m) was 1.538 mmol g⁻¹ and adsorption energy was 33.67 kJ mol⁻¹.

Keywords : *calix[4]resorcinarene, vanillin, adsorption, Pb(II)*