

## **SINTESIS DAN UJI AKTIVITAS SENYAWA C-4-HIDROKSI-3-METOKSIFENILKALIKS[4]RESORSINARENA SEBAGAI ADSORBEN ION Fe(III)**

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### **INTISARI**

Telah dipelajari mekanisme adsorpsi ion Fe(III) dalam medium air oleh senyawa organik turunan kaliks[4]resorsinarena. Tujuan dari penelitian ini untuk mensintesis senyawa adsorben C-4-hidroksi-3-metoksifenilkaliks[4]resorsinarena serta menguji aktivitas adsorpsinya terhadap ion Fe(III) dalam kajian kinetika, model isoterm dan termodinamika. Penelitian diawali dengan melakukan sintesis senyawa C-4-hidroksi-3-metoksifenilkaliks[4]resorsinarena dengan mereaksikan vanilin dan resorsinol menggunakan metode *refluks* selama 20 jam dengan katalis HCl dalam pelarut etanol. Senyawa produk dikarakterisasi dengan spektrometer FTIR, <sup>1</sup>H-NMR dan LC-MS. Kajian adsorpsi dilakukan dalam sistem *batch* dengan variasi pH larutan, waktu interaksi, konsentrasi larutan, dan suhu lingkungan. Kajian kinetika adsorpsi dianalisis menggunakan persamaan Lagergren, Ho&McKay dan Santosa. Kajian isoterm adsorpsi dianalisis dengan persamaan Langmuir dan Freundlich.

Hasil sintesis senyawa C-4-hidroksi-3-metoksifenilkaliks[4]resorsinarena diperoleh sebagai padatan berwarna merah muda pucat dengan rendemen sebesar 93,96%. Berdasarkan kajian adsorpsi yang telah dilakukan diperoleh persentase adsorpsi ion Fe(III) optimum pada pH 4 dan waktu pengadukan 30 menit, sedangkan konsentrasi awal adsorpsi diperoleh 100 ppm. Proses adsorpsi ion logam Fe(III) oleh C-4-hidroksi-3-metoksifenilkaliks[4]resorsinarena mengikuti model kinetika Ho&McKay dengan kapasitas adsorpsi maksimum 2,174 mg/g. Model isoterm lebih sesuai dengan model isoterm Freundlich dengan kapasitas adsorpsi maksimum 6,649 mg/g. Kajian termodinamika menunjukkan proses adsorpsi spontans, endotermik, disosiatif, dan kemisorpsi antara ion logam Fe(III) dan adsorben.

Kata kunci: Fe(III), kaliks[4]resorsinarena, kinetika, isoterm, termodinamika

***SYNTHESIS AND ACTIVITY TEST OF C-4-HYDROXY  
3-METHOXYPHENYLCALIX[4]RESORCINARENE COMPOUND AS  
FE(III) IONS ADSORBENT***

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**ABSTRACT**

The adsorption mechanism of Fe(III) ions in aqueous medium by organic compounds derived from calix[4]resorcinarene has been studied. The purpose of this study was to synthesize adsorbent compounds C-4-hydroxy-3-methoxyphenylcalix[4]resorcinarene and to test its adsorption activity for Fe(III) ions in the study of kinetics, thermodynamics and isotherm models. The research was initiated by synthesizing the C-4-hydroxy-3-methoxyphenylcalix[4]resorcinarene compound through reacting vanillin and resorcinol via reflux method for 20 hours with HCl catalyst in ethanol solvent. The produced compounds were characterized by FTIR, <sup>1</sup>H-NMR, and LC-MS spectrometers. Adsorption studies were carried out using a batch system with variations in solution pH, interaction time, solution concentration, and ambient temperature. Adsorption kinetics were analyzed using the Lagergren, Ho&McKay and Santosa equations while the adsorption isotherm was analyzed by the Langmuir and Freundlich equations.

The produced compound of C-4-hydroxy-3-methoxyphenylcalix[4]resorcinarene was obtained as a pale pink solid with a yield of 93.96 %. Based on the adsorption studies that have been carried out, the optimum persen adsorption of Fe(III) ions was obtained at pH 4 and a stirring time of 30 minutes while the initial concentration of adsorption was obtained at 300 ppm. The adsorption process of Fe(III) metal ions by C-4-hidroxi-3-methoxyphenylcalix[4]resorcinarene follows the Ho & McKay model with a maximum adsorption capacity of 2.174 mg/g. The isotherm model follows the Freundlich isotherm model with a maximum adsorption capacity of 6.649 mg/g. Thermodynamic studies show spontaneous adsorption, endothermic, dissociative, and chemisorption processes between Fe(III) metal ions and adsorbent.

**Keywords:** Fe(III), calix[4]resorcinarene, kinetic, isotherm, thermodynamic