



OPTIMALISASI ADSORPSI *REMAZOL BRILLIANT BLUE R* MENGUNAKAN ADSORBEN SELULOSA TERKATIONISASI

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INTISARI

Penelitian terkait optimalisasi adsorpsi *Remazol Brilliant Blue R* (RBBR) menggunakan adsorben selulosa terkationisasi telah dilakukan. Penelitian ini bertujuan untuk mempelajari proses modifikasi dan karakterisasi hasil kationisasi serat kapas, melakukan optimalisasi kondisi adsorpsi terkait pH, massa adsorben, waktu kontak, dan konsentrasi adsorbat, serta mengkaji efektivitas jenis larutan elektrolit dalam proses desorpsi. Penelitian ini juga menentukan bentuk adsorpsi isoterm dan kinetika adsorpsinya. Model kinetika adsorpsi yang digunakan terdiri atas *pseudo-first order* dan *pseudo-second order* dengan model isoterm adsorpsi berupa Langmuir dan Freundlich.

Modifikasi serat kapas dilakukan melalui proses perendaman serat dalam reagen 3-kloro-2-hidroksipropil trimetila monium klorida (CHPTAC) pada kondisi basa selama 24 jam. Hasil modifikasi dikarakterisasi menggunakan FTIR dan SEM-EDX. Kajian adsorpsi dilakukan dengan menguji pengaruh variasi pH, massa adsorben, waktu kontak, dan konsentrasi adsorbat. Kajian desorpsi dilakukan terhadap adsorben yang telah menyerap RBBR dalam kondisi optimum. Kajian tersebut meliputi uji pengaruh larutan, yaitu akuades, larutan NaCl 1 M, NaCl 0,1 M, NaSCN 1 M, dan NaSCN 0,1 M, serta uji pengaruh waktu desorpsi dalam variasi waktu 15, 30, dan 60 menit.

Hasil karakterisasi FTIR menunjukkan adanya gugus trimetil amonium dari molekul CHPTAC. Hasil SEM menunjukkan bahwa terbentuk pori di area permukaan dan terdapat komponen aglomerat atau endapan dari CHPTAC. Kajian adsorpsi menunjukkan bahwa kapasitas adsorpsi (q) optimum bernilai 116 mg g^{-1} terjadi pada kondisi pH 8 dan massa adsorben 30 mg dengan konsentrasi RBBR 200 mg L^{-1} selama 60 menit. Adsorpsi RBBR oleh kapas modifikasi mengikuti kinetika reaksi *pseudo-second order* dengan konstanta laju adsorpsi bernilai $6,2 \times 10^{-4} \text{ g mg}^{-1} \text{ min}^{-1}$ dan model adsorpsi isoterm Langmuir. Proses desorpsi yang optimum terjadi dalam larutan NaSCN 1 M selama 60 menit sesuai teori *Hofmeister effect*.

Kata kunci: adsorpsi, CHPTAC, epoksi, kapas, kationisasi



OPTIMIZATION OF REMAZOL BRILLIANT BLUE R ADSORPTION USING CATIONIZED CELLULOSE

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ABSTRACT

Research about optimization of Remazol Brilliant Blue R (RBBR) adsorption using cationized cellulose adsorbent has been conducted. The purpose of this research is to study the modification process and characterization of cationized cotton fiber, to optimize the adsorption condition related to pH, adsorbent mass, contact time, and adsorbate concentration, to study the effectiveness of electrolyte solution for desorption process. The adsorption kinetic was determined using pseudo-first order and pseudo-second order while the isotherm adsorption Langmuir and Freundlich models.

Cotton fiber modification was carried out by soaking the fiber in 3-chloro-2-hydroxypropyl trimethylammonium chloride (CHPTAC) under alkaline condition for 24 hours. The characterization of modification results used FTIR and SEM-EDX. The adsorption study was carried out by examining the effect of variations of pH, adsorbent mass, contact time, and adsorbate concentration. Desorption study was carried out on the adsorbent that had adsorbed RBBR under optimum condition then examined the effect of solution such as distilled water, 1 M NaCl solution, 0.1 M NaCl solution, 1 M NaSCN solution, and 0.1 M NaSCN solution for 15, 30, and 60 minutes.

The results of FTIR characterization showed that trimethyl ammonium group from CHPTAC was found. SEM of modification fiber showed that pores were formed on the surface area and there were new components in the surface from CHPTAC. The adsorption study resulted that the optimum adsorption capacity (q) was 116 mg g^{-1} , it was occurred at pH 8 and an adsorbent mass was 30 mg with 200 mg L^{-1} RBBR solution for 60 minutes. The adsorption of RBBR by modified cotton followed pseudo-second order reaction kinetics with an adsorption rate constant of $6,2 \times 10^{-4} \text{ g mg}^{-1} \text{ min}^{-1}$ and Langmuir isotherm adsorption model. The optimum desorption process occurred in 1 M NaSCN solution for 60 minutes in accordance with the Hofmeister effect.

Keywords: adsorption, cationization, CHPTAC, cotton, epoxy