



PEMBUATAN ADSORBEN SELULOSA–ARGININ UNTUK ADSORPSI ZAT WARNA *SAFRANIN O* DAN *BASIC FUCHSIN*

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INTISARI

Pembuatan adsorben selulosa–arginin untuk adsorpsi zat warna safranin o dan basic fuchsin telah dilakukan. Penelitian ini bertujuan mentaut silangkan arginin dengan selulosa menggunakan epiklorohidrin, menentukan massa perbandingan adsorben, pH optimum, konsentrasi optimum, waktu kontak, dan studi desorpsi larutan zat warna safranin o (SO) dan basic fuchsin (BF).

Tahap awal adsorben diawali dengan isolasi selulosa yang bersumber dari jerami padi. Selanjutnya arginin ditaut silangkan pada selulosa dalam larutan NaOH dan ditambahkan agen penaut silang epiklorohidrin sembari dipanaskan selama 2 jam pada suhu 60 °C. Diperoleh adsorben selulosa–arginin tertaut silang epiklorohidrin (S–Epi–Arg) yang kemudian dikarakterisasi oleh spektrofotometer FTIR, XRD, dan SEM. Sebelum dan sesudah adsorpsi larutan zat warna SO dan BF dianalisis menggunakan instrumen spektrofotometer UV-Vis. Studi desorpsi larutan zat warna SO dan BF dilakukan pada larutan pendesorpsi berupa aquades pH 4, NaCl 0,1 dan 1 M, serta etanol 40 dan 60%.

Hasil karakterisasi instrumen FTIR menunjukkan adsorben S–Epi–Arg memiliki situs aktif di antaranya –OH dan –COOH. Karakterisasi XRD menunjukkan puncak difraksi pada sudut 2θ 11,89; 20,58; 22,13 dan 38,61° yang mengindikasikan adanya senyawa galaktosa, xilosa, glukosa, arabinosa dan polisakarida. Hasil SEM-EDX menunjukkan permukaan adsorben dengan ukuran pori yang seragam dan menunjukkan keberadaan unsur C, N, O dalam S–Epi–Arg serta unsur Cl setelah adsorpsi larutan zat warna SO dan BF. Perbandingan massa adsorben optimum S–Epi–Arg diperoleh pada perbandingan 1:0,2 g. pH optimum S–Epi–Arg terhadap zat warna SO dan BF masing-masing terjadi pada rentang pH 7 dengan konsentrasi 250 mg/L, dan waktu kontak 80 menit untuk SO dan 100 menit untuk BF. Pada adsorpsi zat warna SO dan BF oleh S–Epi–Arg mengikuti isotherm Langmuir dan model kinetika orde dua semu dengan kapasitas adsorpsi masing-masing zat warna SO dan BF sebesar 76,13 dan 79,41 mg/g. Studi desorpsi zat warna SO dan BF menunjukkan efektivitas terjadi pada etanol 60%.

Kata kunci: taut silang, epiklorohidrin, selulosa, arginin, adsorpsi

***PREPARATION OF CELLULOSE–ARGININE AS ADSORBENT FOR
ADSORPTION OF SAFRANIN O AND BASIC FUCHSIN DYES***

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ABSTRACT

Preparation of cellulose–arginine as adsorbent for adsorption safranin o and basic fuchsin dyes has been performed. This study aims to crosslinked arginine to cellulose with epichlorohydrin crosslinked agent, determine the mass ratio of adsorbents, optimum pH, optimum concentration, contact time, and desorption study of safranin o (SO) and basic fuchsin (BF) dye solutions.

The initial stage of the adsorbent begins with the isolation of cellulose sourced from rice straw. Furthermore, arginine was crosslinked to cellulose in NaOH solution by adding epichlorohydrin as a cross-linker agent while being heated for 2 hours at 60 °C. Cellulose–arginine adsorbent crosslinked with epichlorohydrin (S–Epi–Arg) was obtained and characterized by FTIR, XRD, and SEM spectrophotometer. Before and after adsorption of SO and BF dye solutions were analyzed using a UV-Vis spectrophotometer instrument. Desorption studies of SO and BF dye solutions were carried out using aquades pH 4, NaCl 0.1 and 1 M, and ethanol 40 and 60%.

The characterization results of the FTIR instrument show that the adsorbent S–Epi–Arg has active sites including –OH and –COOH. XRD characterization results showed that the diffraction peak at angles 2θ 11,89; 20,58; 22,13; and 38.61° indicates the presence of galactose, xylose, glucose, arabinose, and polysaccharide compounds. SEM-EDX results showed an adsorbent surface with a regular pore size and the presence of elements C, N, O in (S–Epi–Arg) and element Cl after adsorption of SO and BF dye solutions. The optimum adsorbent mass of S–Epi–Arg was obtained at 1:0.2 g. Optimum pH of S–Epi–Arg towards dyes SO and BF occurred in pH 7 with a concentration of 250 mg/L, respectively, and a contact time of 80 minutes for SO and 100 minutes for BF. The adsorption of SO and BF dyes by S–Epi–Arg follows the Langmuir isotherm and a pseudo-second-order kinetic model with adsorption capacities from SO and BF dyes are 76.13 and 79.41 mg/g, respectively. SO and BF dye desorption studies showed effectiveness in 60% ethanol.

Keywords: crosslink, epichlorohydrin, arginine, cellulose, adsorption