Studi Pengaruh Komposisi Xanthan gum-Alginati-Kitosan, Konsentrasi CaCl?, dan Ukuran Beads terhadap
Kemampuan Adsorpsi Pewarna Sintetik
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INTISARI

Crystal violet merupakan pewarna sintetis yang banyak digunakan dalam industri, tetapi limbahnya bersifat toksik dan sulit terurai sehingga berpotensi mencemari lingkungan. Penelitian ini bertujuan mengetahui pengaruh variasi komposisi xanthan gum, alginat, dan kitosan terhadap karakteristik serta kemampuan adsorpsi *hydrogel beads* dalam menyerap crystal violet.

Hydrogel beads menggunakan metode gelasi ionik menggunakan $CaCl_2$ sebagai agen pengikat silang dengan variasi rasio polimer, total konsentrasi polimer, dan ukuran *beads*. Karakterisasi *hydrogel beads* dilakukan melalui uji organoleptik, diameter beads, *swelling ratio*, degradasi, dan kapasitas adsorpsi menggunakan spektrofotometri UV-Vis.

Formula dengan kapasitas adsorpsi tertinggi diperoleh pada Formula 1 dengan rasio xanthan gum:alginat:kitosan sebesar 25:25:50 dan total konsentrasi polimer 1% sebesar 0,0110%. Tingginya kemampuan adsorpsi dipengaruhi oleh struktur matriks yang berpori dan luas permukaan kontak yang besar sehingga *hydrogel beads* berpotensi digunakan sebagai adsorben efektif untuk mengurangi pencemaran limbah zat warna sintetis crystal violet.

Kata kunci: pewarna sintetis, crystal violet, *hydrogel beads* , adsorpsi

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ABSTRACT

Crystal violet is a synthetic dye widely used in various industries. However, its wastewater is toxic, poorly biodegradable, and has the potential to cause environmental pollution. This study aimed to investigate the effect of variations in the composition of xanthan gum, alginate, and chitosan on the characteristics and adsorption capacity of hydrogel beads for the removal of crystal violet.

The hydrogel beads were prepared using the ionic gelation method with $CaCl_2$ as the crosslinking agent by varying the polymer ratio, total polymer concentration, and bead size. The hydrogel beads were characterized through organoleptic evaluation, bead diameter, swelling ratio, degradation, and adsorption capacity using UV–Vis spectrophotometry.

The highest adsorption capacity was obtained by Formula 1, with a xanthan gum:alginate:chitosan ratio of 25:25:50 and a total polymer concentration of 1% (w/v), resulting in an adsorption capacity of 0.0110%. The superior adsorption performance was attributed to the porous matrix structure and the large contact surface area, indicating that the hydrogel beads have the potential to serve as an effective adsorbent for reducing crystal violet contamination in synthetic dye wastewater.

Keywords: synthetic dye, crystal violet, hydrogel beads, adsorption