

## INTISARI

### **SINTESIS BAHAN MAGNETIK BESI TERLAPIS KITOSAN TERMODIFIKASI GLISIDILTRIMETILAMMONIUM KLORIDA (GTMAC) UNTUK ADSORPSI Cr(VI)**

**Rizky Putra**

**21/485735/PPA/06225**

Seiring dengan pertumbuhan industri yang pesat, logam berat saat ini menjadi bahan pencemar yang banyak ditemukan baik di sungai maupun sumber air salah satunya adalah krom. Kromium heksavalen memiliki toksisitas 100 kali lebih besar dibandingkan kromium trivalennya. Hal ini karena Cr(VI) sangat aktif larut dan beracun karena dapat berdifusi sebagai anion kromat  $\text{CrO}_4^{2-}$ . Pada penelitian ini telah dilakukan sintesis bahan magnetik besi terlapis kitosan termodifikasi ammonium kuartener berupa glisidiltrimetilammonium klorida (GTMAC) dan aplikasinya untuk adsorpsi anion Cr(VI). Penelitian ini diawali dengan isolasi material magnetik (MM) dari pasir besi, sintesis material magnetik-kitosan (MM-Kit), dan sintesis material magnetik-kitosan termodifikasi glisidiltrimetilammonium klorida (MM-Kit-GTMAC) dengan variasi perbandingan kitosan : GTMAC (1:2, 1:6, 1:10, dan 1:15). Produk sintesis dikarakterisasi dengan FT-IR, XRD, dan SEM-EDX. Uji stabilitas material dilakukan pada variasi pH dimana filtrat yang diperoleh dianalisis kandungan Fe dengan AAS, material yang larut dianalisis dengan UV-Vis dan material yang tidak larut ditimbang. Parameter uji adsorpsi antara lain meliputi variasi pH, waktu kontak, dan konsentrasi awal anion Cr(VI). Anion Cr(VI) yang tidak teradsorpsi dianalisis dengan AAS.

Hasil penelitian menunjukkan bahwa MM-Kit-GTMAC telah berhasil disintesis. Keberadaan GTMAC mampu meningkatkan kestabilan material komposit MM-Kit dan menggeser pH optimum pada adsorpsi anion Cr(VI) dari pH 3 ke pH 4. Studi kinetika dan isoterm adsorpsi menunjukkan bahwa adsorpsi anion Cr(VI) pada MM-Kit-GTMAC (dengan perbandingan massa Kitosan : GTMAC = 1:15) mengikuti model kinetika orde dua semu dengan konstanta laju  $3,13 \times 10^{-3} \text{ mol mg}^{-1} \text{ menit}^{-1}$  dan isoterm Langmuir dengan kapasitas adsorpsi  $102,041 \text{ mg g}^{-1}$ , yang potensial untuk diaplikasikan pada pengolahan limbah tercemar anion Cr(VI).

Kata kunci: adsorpsi, anion Cr(VI), material magnetik, kitosan, GTMAC

## ABSTRACT

### **SYNTHESIS OF CHITOSAN-IRON MAGNETIC MATERIALS MODIFIED GLYCIDYLTRIMETYLAMMONIUM CHLORIDE (GTMAC) FOR Cr(VI) ADSORPTION**

**Rizky Putra**

**21/485735/PPA/06225**

Along with the rapid growth of industry, heavy metals are currently becoming pollutants that are widely found in rivers and water sources, one of which is chromium. Hexavalent chromium has 100 times greater toxicity than trivalent chromium. This is because Cr (VI) is very active, soluble and toxic because it can diffuse as the chromate anion  $\text{CrO}_4^{2-}$ . In this study, the synthesis of magnetic iron coated with quaternary ammonium-modified chitosan in the form of glycidyltrimethylammonium chloride (GTMAC) and its application for the adsorption of Cr (VI) anions has been carried out. This study began with the isolation of magnetic material (MM) from iron sand, the synthesis of magnetic-chitosan material (MM-Chi), and the synthesis of magnetic-chitosan material modified by glycidyltrimethylammonium chloride (MM-Chi-GTMAC) with mass ratio of Chitosan : GTMAC (1:2, 1:6, 1:10, and 1:15). The synthesis products were characterized by FT-IR, XRD, and SEM-EDX. The material stability test was carried out at pH variations where the obtained filtrate was analyzed for Fe content with SAA, the soluble material was analyzed with UV-Vis and the insoluble material was weighed. The adsorption test parameters included pH variations, contact time, and initial concentration of Cr(VI) anions. The unadsorbed Cr(VI) anions were analyzed with SAA.

The results showed that MM-Chi-GTMAC had been successfully synthesized. The presence of GTMAC can increase the stability of MM-Chi composite material and shift the optimum pH for Cr(VI) anion adsorption from pH 3 to pH 4. Kinetic and isotherm studies of adsorption show that the adsorption of Cr(VI) anions on MM-Chi-GTMAC (with a mass ratio of Chitosan : GTMAC = 1:15) follows a pseudo-second-order kinetic model with a rate constant of  $3.13 \times 10^{-3} \text{ mol mg}^{-1} \text{ min}^{-1}$  and a Langmuir isotherm with an adsorption capacity of  $102.041 \text{ mg g}^{-1}$ , which has the potential to be applied to the treatment of waste contaminated with Cr(VI) anions.

Keywords: , adsorption, Cr(VI) anion, magnetic material, chitosan, GTMAC