

**PENGUNAAN 3-KLOROPROPIL TRIMETOKSISILAN SEBAGAI  
PENGHUBUNG KITOSAN DENGAN SILIKA TERLAPIS  
PADA BAHAN MAGNETIK PASIR BESI  
UNTUK ADSORPSI Au(III)**

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**INTISARI**

Telah dilakukan penggunaan 3-kloropropil trimetoksisilan (CPTMS) sebagai penghubung kitosan dengan silika terlapis pada bahan magnetik pasir besi untuk adsorpsi Au(III). Bahan magnetik (BM) dipisahkan dari pasir besi menggunakan magnet kemudian dicuci dengan larutan HF 10 %. BM-silika-CPTMS-kitosan disintesis melalui proses sol gel dengan variasi teknik pencampuran bahan untuk mendapatkan material dengan karakter terbaik. Pada penelitian ini rasio mol CPTMS : kitosan divariasi 0:4; 1:4; 2:4; 3:4; dan 4:4. Produk hasil sintesis dikarakterisasi dengan *Fourier Transform Infrared* (FTIR) *Spectrophotometer* untuk mengidentifikasi gugus fungsional dan *Scanning Electron Microscopy-Energy Dispersive X-Ray Spectrometer* (SEM-EDS) untuk mengetahui morfologi dan komposisi material. Kestabilan termal produk dianalisis dengan *Thermogravimetric Analysis* (TGA). Kekuatan magnet produk diuji dengan *Vibrating Sample Magnetometer* (VSM). Struktur kristal produk dianalisis dengan *X-Ray Difraktometer* (XRD). Produk hasil sintesis diuji kestabilannya dalam asam. Adsorpsi produk terhadap Au(III) dilakukan dalam sistem *batch* dengan variasi pH dan konsentrasi. Adsorben dipisahkan dengan magnet dan Au(III) yang tidak teradsorpsi dianalisis dengan *Atomic Absorption Spectroscopy* (AAS).

Hasil karakterisasi FTIR menunjukkan bahwa teknik pencampuran yang meliputi penambahan campuran BM-silika ke dalam campuran CPTMS-kitosan menghasilkan BM-silika-CPTMS-kitosan dengan karakter terbaik. Adsorpsi maksimum Au(III) pada BM-silika-CPTMS-kitosan terjadi pada pH 5 dan mengikuti model isotherm adsorpsi Langmuir dengan nilai kapasitas 112,36 mg g<sup>-1</sup>. Penggunaan penghubung CPTMS meningkatkan kestabilan produk pada kondisi asam, meskipun kapasitasnya sedikit lebih rendah dibandingkan kapasitas pada sampel tanpa penghubung.

Kata-kata kunci: silika, kitosan, pasir besi, 3-kloropropil trimetoksisilan, adsorpsi Au(III)

**USING OF 3-CHLOROPROPYL TRIMETHOXYSILANE AS GRAFTING  
AGENT OF CHITOSAN WITH SILICA COATED ON  
IRON SAND MAGNETIC MATERIAL  
FOR ADSORPTION OF Au(III)**

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**ABSTRACT**

Using of 3-chloropropyl trimethoxysilane (CPTMS) as grafting agent of chitosan with silica coated on iron sand magnetic material for adsorption of Au(III) has been studied. Magnetic materials (BM) from iron sand was separated using an magnet and washed with HF 10 %. BM-silika-CPTMS-kitosan was synthesized via sol gel process by varying the mixing technique to get the material with the best character. In this study mol ratios of chitosan to CPTMS were variated 0:4; 1:4; 2:4; 3:4; and 4:4. Products were characterized with Fourier Transform Infrared (FTIR) Spectrophotometer to identify functional groups and Scanning Electron Microscopy-Energy Dispersive X-Ray Spectrometer (SEM-EDS) to identify morphology and elemental composition of materials. Thermal stability of products was analyzed with Thermogravimetric Analysis (TGA). Magnetic strength of material was analyzed with Vibrating Sample Magnetometer (VSM). Crystal structure of material was analyzed with X-Ray Difraktometer (XRD). Stability of products in acidic condition were also investigated. The adsorption of Au(III) on the product was done in a batch system with variation of pH and concentration. Adsorbent was separated using magnet and unadsorbed Au(III) was analyzed with Atomic Absorption Spectroscopy.

FTIR characterization result indicated that that mixing technique which include the addition of BM-silika mixture into CPTMS-kitosan produced the best BM-silika-CPTMS-kitosan. The adsorption of Au(III) on BM-silika-CPTMS-kitosan occurs at pH 5 and follow the model of the Langmuir isotherm with adsorption capacity value 112,36 mg g<sup>-1</sup>. The use of CPTMS as grafting agent improved the stability of the product under acidic condition, although adsorption capacity was slightly lower than sample without a grafting agent.

Key words: silica, chitosan, sand iron, 3-chloropropyl trimethoxysilane, adsorption of Au(III)