

**PELAPISAN HIBRIDA AMINOBENZIMIDAZOL-SILIKA PADA
MAGNETIK PASIR BESI UNTUK ADSORPSI-DESORPSI
LARUTAN Au(III),Cu(II),DAN Ni(II)**

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14/373328/PPA/04790

INTISARI

Telah dipelajari adsorpsi-desorpsi Au(III) dalam larutan ion logam Au(III), Cu(II), dan Ni(II) dengan menggunakan hibrida aminobenzimidazol-silika terlapis pada bahan magnetik pasir besi (BM/SiO₂-ABI). BM/SiO₂-ABI disintesis melalui proses sol-gel menggunakan bahan magnetik (BM) dari pasir besi, natrium silikat (Na₂SiO₃) sebagai sumber silika, dan 2-aminobenzimidazol (ABI) sebagai sumber gugus amina. Senyawa 3-kloropropiltrimetoksisilan (CPTS) digunakan sebagai pengikat ABI pada silika. Karakteristik BM/SiO₂-ABI yang diidentifikasi dan dievaluasi meliputi keberadaan gugus fungsi, kristalinitas, pH_{PZC}, dan uji stabilitas pada berbagai pH. Adsorpsi Au(III) dalam sistem *batch* dilakukan sebagai fungsi pH, waktu kontak, dan konsentrasi ion. Kinetika adsorpsi dievaluasi dengan model *pseudo* orde 1 dan *pseudo* orde 2 berdasarkan data variasi waktu kontak, sedangkan isoterm adsorpsi dipelajari berdasarkan model Langmuir dan Freundlich. Adsorpsi ion logam Au(III), Cu(II), dan Ni(II) secara kuantitatif dihitung berdasarkan perbedaan konsentrasi logam sebelum dan sesudah adsorpsi yang dianalisis dengan Spektrofotometer Serapan Atom (SSA).

Hasil karakterisasi menunjukkan bahwa BM/SiO₂-ABI telah berhasil disintesis melalui proses sol-gel. Pelapisan ABI-silika pada BM menunjukkan kestabilan adsorben pada pH 1,0-6,0. Sifat magnet BM tidak berubah dan masih memberikan nilai magnetisasi saturasi maksimum yang tinggi setelah pelapisan. Adsorpsi Au(III) pada BM/SiO₂-ABI menurun dengan meningkatnya pH dalam rentang 1,0-6,0 dan mengikuti model kinetika *pseudo* orde 2 dengan konstan laju (*k*) sebesar 1,16 x10⁻² g mg⁻¹ min⁻¹. BM/SiO₂-ABI menunjukkan plot linier terhadap model isoterm Langmuir dengan kapasitas adsorpsi untuk Au(III) sebesar 16,90 mg/g. Adsorpsi pada larutan ion logam menunjukkan bahwa kapasitas adsorpsi dan selektivitas yang tinggi terhadap Au(III) daripada Cu(II) dan Ni(II).

Kata kunci : adsorpsi, emas, silika, aminobenzimidazol, pasir besi

**COATING OF AMINOBENZIMIDAZOLE-SILICA HYBRID ON IRON
SAND MAGNETIC FOR ADSORPTION-DESORPTION
OF Au(III), Cu(II), AND Ni(II) SOLUTION**

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ABSTRACT

Adsorption-desorption of Au(III) in metal ions Au(III), Cu(II), and Ni(II) on aminobenzimidazol-silica hybrid coated on iron sand magnetic materials (MM/SiO₂-ABI) has been studied. MM/SiO₂-ABI was synthesized via sol-gel process by using iron sand magnetic material materials (MM), sodium silicat (Na₂SiO₃) as silica source, and 2-aminobenzimidazoel (ABI) as amine group source. 3-kloropropiltrimetoksisilan (CPTS) is used as binder ABI on silica. Characters of the MM/SiO₂-ABI including the functional group presence, crystallinity, pH_{PZC}, and stability toward pH 1.0-6.0 were identified and evaluated. Adsorption of Au(III) in a batch system was carried out as function of pH, contact time, and ion concentration. Adsorption kinetics was evaluated with pseudo-first order and pseudo-second order models based on the data of contact time variation, while the adsorption isotherm was studied based on Langmuir and Freundlich models. The adsorption metal ions of Au(III), Cu(II) and Ni(II) were quantitatively calculated based on the difference of metal concentrations before and after adsorption analyzed with atomic absorbance spectrophotometer (AAS).

Results of characterization showed that MM/SiO₂-ABI has been successfully synthesized. Coating of ABI-silica on MM increased stability toward pH 1.0-6.0. The magnetic property of MM did not change and still gives high value of maximum saturation magnetization after coating. Adsorption of Au(III) on MM/SiO₂-ABI decreased with increasing the pH in a range of 1.0-6.0 and fits to pseudo-second order model with the rate constant (k) of 1.16x10⁻² g mg⁻¹ min⁻¹. MM/SiO₂-ABI showed a linear plot of Langmuir isotherm model with the adsorption capacity for Au(III) is 16.90 mg/g. Adsorption on metal ions solution showed that adsorption capacity and selectivity of Au(III) on MM/SiO₂-ABI was higher than Cu(II) and Ni(II).

Keywords : adsorption, gold, silica, aminobenzimidazole, iron sand