UJI DETEKSI MERKURI (Hg^{2+}) DENGAN NANOPARTIKEL EMAS (AuNP) MENGGUNAKAN LIGAN GLUTATION, SISTEIN, DAN DITIOTREITOL DENGAN METODA KOLORIMETRI

SKRIPSI

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Kutipan atau saduran baik sebagian ataupun seluruh naskah, harus menyebut nama pengarang, dan sumber asalinya, yaitu Sekolah Tinggi Farmasi Indonesia

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ABSTRAK

Penggunaan merkuri pada kosmetik masih menjadi masalah serius meskipun telah dilarang secara global. Paparan merkuri dapat menyebabkan toksisitas sistemik, sehingga dibutuhkan metode deteksi yang cepat, sensitif, dan ekonomis. Penelitian ini bertujuan menentukan ligan paling sensitif dan stabil dalam sistem deteksi ion merkuri (Hg^{2+}) berbasis nanopartikel emas (AuNP) yang dimodifikasi dengan glutation, sistein, dan ditiotreitol. Metode penelitian eksperimental dimana AuNP disintesis menggunakan metode reduksi natrium sitrat, kemudian difungsionalisasi dengan ketiga ligan tiol. Analisis dilakukan menggunakan spektrofotometri UV-Visibel dan Kromatografi Lapis Tipis untuk menilai interaksi AuNP–ligan–Hg^{2+}. Hasil spektrofotometri UV-Visibel menunjukkan pergeseran panjang gelombang dan peningkatan absorbansi setelah penambahan Hg^{2+}, menandakan terbentuknya kompleks Au–S–Hg. Sistem Ditiotreitol+AuNP+Hg^{2+} menunjukkan absorbansi tertinggi (2,350), diikuti glutation dan sistein. Hasil KLT menunjukkan glutation memiliki spot paling jelas dengan peningkatan nilai Rf dari 0,46 menjadi 0,71, sedangkan sistein menunjukkan noda samar dan ditiotreitol tidak tampak noda. Kesimpulan dari penelitian ini adalah sistem AuNP-Glutation-Hg^{2+} menunjukkan kestabilan dan reaktivitas terbaik sehingga berpotensi dikembangkan sebagai sensor kolorimetri merkuri yang sederhana dan efektif.

Kata kunci: Ditiotreitol, glutation, merkuri, nanopartikel emas, sistein

ABSTRACT

The use of mercury in cosmetics is still a serious problem even though it has been banned globally. Mercury exposure can cause systemic toxicity, so fast, sensitive, and economical detection methods are needed. This study aimed to determine the most sensitive and stable ligands in the mercury ion (Hg^{2+}) detection system based on gold nanoparticles (AuNP) modified with glutathione, cysteine, and ditiotreitol. The experimental research method, AuNP was synthesized using the sodium citrate reduction method, then functionalized with the three thiol ligands. The analysis was performed using UV-Visible spectrophotometry and thin-layer chromatography to assess the AuNP–ligand–Hg^{2+} interaction. UV-Visibel spectrophotometry results showed wavelength shifts and increased absorbance after the addition of Hg^{2+}, indicating the formation of the Au–S–Hg complex. The Ditiotreitol+AuNP+Hg^{2+} system showed the highest absorbance (2,350), followed by glutathione and cysteine. The KLT results showed glutathione had the most obvious spots with an increase in Rf values from 0.46 to 0.71, while cysteine showed faint stains and ditiotreitol was not visible. The conclusion of this study is that the AuNP–Glutation–Hg^{2+} system shows the best stability and reactivity so that it has the potential to be developed as a simple and effective mercury colorimetric sensor.

Keywords: *Cysteine, ditiotreitol, glutathione, gold nanoparticles, mercury*

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