Pengembangan Paper-Based Analytical Device (PAD) untuk Analisis Merkuri secara Kolorimetri Menggunakan Nanopartikel Emas Terkonjugasi Asam Sianurat = Development of a Paper-Based Analytical Device (PAD) for Colorimetric Analysis of Mercury Using Cyanuric Acid Conjugated Gold Nanoparticles

Amaranggani Wikan Puspita Kenanga, author

Abstrak

Merkuri merupakan salah satu logam berat yang dapat ditemukan di perairan baik air tawar maupun air laut dan memiliki toksisitas yang tinggi sehingga penyebarannya perlu dikendalikan. Telah ditemukan bahwa nanopartikel emas yang terkonjugasi asam sianurat memiliki kemampuan untuk mendeteksi Hg2+ dengan prinsip kolorimetri. Oleh karena itu, penilitian ini bertujuan untuk mengembangkan metode deteksi merkuri yang sensitif dan selektif menggunakan nanopartikel emas terkonjugasi asam sianurat dalam perangkat berbasis kertas. Kondisi optimum dalam preparasi kertas saring untuk menghasilkan sensor yang paling baik yaitu dengan menggunakan kertas saring Whatman No. 1 yang direndam dalam larutan AuNP terkonjugasi asam sianurat selama 24 jam dan pengeringan pada suhu 50oC selama 10 menit. Analisis dilakukan setelah perangkat kertas diteteskan sampel sebanyak 20 µL sehingga terjadi perubahan warna yang jelas dari merah muda ke warna ungu kebiruan setelah 5 menit. Deteksi dapat diamati secara visual dengan mata telanjang hingga konsentrasi Hg2+ yang cukup kecil yaitu 0,05 µM. Respon kolorimetri sensor juga selektif terhadap Hg2+ setelah dilakukan pengujian dengan ion-ion logam Ba2+, Zn2+, Cd2+, Mn2+, Cu2+, Mg2+, Ag2+, dan Fe2+. Selain itu, respon dari sensor juga konsisten untuk sampel air danau yang dibubuhi Hg2+. Hasil dari penelitian ini yaitu dapat memberikan teknologi dasar yang menjanjikan untuk pengembangan sensor yang terjangkau, cepat, portabel, dan mudah digunakan untuk deteksi dan pemantauan kadar Hg2+ dalam air.

.....Mercury is one of the heavy metals that can be found in both fresh water and sea water and has high toxicity so that its spread needs to be controlled. It has been found that gold nanoparticles conjugated with cyanuric acid have the ability to detect Hg2+ by the colorimetric principle. Therefore, this research aims to develop a sensitive and selective mercury detection method using cyanuric acid-conjugated gold nanoparticles in a paper-based device. The optimum condition for preparing filter paper to produce the best sensor is using Whatman No. filter paper. 1 which was soaked in AuNP solution which had been conjugated with cyanuric acid for 24 hours and dried at 50oC for 10 minutes. Analysis was carried out after 20 µL of sample was dropped on the paper device so that there was a clear color change from pink to bluish-purple after 5 minutes. Detection can be observed visually with the naked eye down to a fairly small Hg2+ concentration of 0.05 µM. The colorimetric response of the sensor is also selective towards Hg2+ after testing with metal ions Ba2+, Zn2+, Cd2+, Mn2+, Cu2+, Mg2+, Ag2+, and Fe2+. In addition, the response from the sensor is also consistent for lake water samples spiked with Hg2+. The results of this research can provide a promising basic technology for the development of sensors that are affordable, fast, portable, and easy to use for the detection and monitoring of Hg2+ levels in water.Mercury is one of the heavy metals that can be found in both fresh water and sea water and has high toxicity so that its spread needs to be controlled. It has been found that gold nanoparticles conjugated with cyanuric acid have the ability to detect Hg2+ by

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