Sensor elektrokimia kolesterol non-enzimatik berbasis katalis nikel (ni) dan tembaga (cu) = Electrochemical non enzymatic cholesterol sensor based on cu and ni catalysts

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Abstrak

ABSTRAK
Kolesterol memiliki fungsi fisiologis yang luas dalam tubuh manusia, namun jika konsentrasinya melebihi batas normal maka dapat memicu penyakit seperti arteriosklerosis. Oleh karena itu metode penentuan kolesterol yang cepat dan akurat dikembangkan. Dari semua metode, sensor enzimatik banyak mendapat perhatian, namun sensor ini memilik kekurangan seperti mudah terdenaturasi. Oleh sebab itu penentuan kadar kolesterol menggunakan sensor non-enzimatik saat ini banyak dikembangkan. Perangkat sensor kolesterol non-enzimatik yang dibuat dalam penelitian ini yaitu screen printed electrode SPE yang dideposisi Cu, Ni, dan CuNi yang terhubung dengan potensiostat. Elektrodeposisi Cu, Ni, dan CuNi masing ndash; masing dilakukan pada potensial -0,512 V, -0,326 V, dan -0,804 V dengan variasi waktu deposisi 60 s, 30 s, dan 5 s. Waktu deposisi optimum yang didapatkan yaitu 60 s berdasarkan nilai linearitas, LOD, dan sensitivitas yang didapat dari deteksi kolesterol sistem batch. Cu/SPE, Ni/SPE, CuNi/SPE kemudian diterapkan dalam sistem Flow Injection Analysis FIA . Kinerja sensor optimum diperoleh pada sistem FIA dengan laju alir 0,5 mL/menit dan konsentrasi KOH 1 M. Sensor Cu/SPE, Ni/SPE, dan CuNi/SPE dalam sistem FIA masing ndash; masing memiliki LOD sebesar 1,08, 13,59, 1,24 M dan sensitivitas sebesar 3.584,97, 465,98, 3.258,54 A mM-1 cm-2. Sensor Cu/SPE, Ni/SPE, CuNi/SPE memiliki repeatabilitas yang baik dengan nilai RSD masing ndash; masing 0,68 1,58, dan 1,16. Sensor Cu/SPE, Ni/SPE, CuNi/SPE memiliki reprodusibilitas yang baik dengan nilai RSD masing ndash; masing 0,72, 1,76, dan 0,91. Sensor memiliki stabilitas yang baik yang diukur selama lima hari berturut ndash; turut dengan nilai RSD masing ndash; masing 0,66, 1,54, dan 0,93. Sensor juga selektif terhadap kolesterol dari zat penginterferensi umum yaitu glukosa, sukrosa, fruktosa, asam askorbat, dan NaCl. Cu/SPE, Ni/SPE, dan CuNi/SPE berhasil menentukan kadar kolesterol dalam sampel susu kemasan dan menunjukkan perbedaan hasil 1,88 , 3,59 , dan 3,05 serta recovery 99,79 , 98,61 dan 99,02 berturut ndash; turut.
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ABSTRACT
Cholesterol has a wide physiological function in the human body, but if the concentration exceeds the normal limit it can trigger diseases such as arteriosklerosis. So rapid and accurate method of determining cholesterol is developed. Of all the methods, enzymatic sensors have received much attention, but these sensors have such deficiencies as easily denatured. Therefore, the determination of cholesterol levels using non enzymatic sensors is now widely developed. The non enzymatic cholesterol sensor device made in this study is a screen printed electrode SPE deposited with Cu, Ni, and CuNi connected to a potentiostat. The electrodeposition of Cu, Ni, and CuNi were each performed at a potential of 0.512 V, 0.326 V, and 0.804 V with variations of deposition time of 60 s, 30 s, and 5 s. The optimum deposition time obtained was 60 s based on linearity, LOD, and sensitivity obtained from batch system cholesterol detection. Cu SPE, Ni SPE, CuNi SPE are then applied in the Flow Injection Analysis FIA system. The optimum sensor performance

was obtained in FIA system with 0.5 mL min flow rate and KOH concentration of 1 M. Cu SPE, Ni SPE, and CuNi SPE sensors in FIA system each have LOD of 1.08, 13.59, 1.24 M and sensitivity of 3,584.97, 465.98, 3,258.54 A mM 1 cm 2. Cu SPE, Ni SPE, CuNi SPE sensors have good repeatability with RSD values of 0.68 1.58 and 1.16, respectively. Cu SPE, Ni SPE, CuNi SPE sensors have good reproducibility with RSD values of 0.72, 1.76, and 0.91, respectively. The sensors have good stability measured for five consecutive days with RSD values of 0.66, 1.54, and 0.93, respectively. Sensors are also selective against cholesterol from common interfering substances such as glucose, sucrose, fructose, ascorbic acid, and NaCl. Cu SPE, Ni SPE, and CuNi SPE succeeded in determining cholesterol levels in packaging milk samples and showing a difference of 1.88 , 3.59 , and 3.05 and 99.79 , 98.61 And 99.02 respectively.