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Electrocatalytic determination of thiols using hybrid Copper Cobalt Hexacyanoferrate modified glassy carbon electrode

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### Abstract

An electrochemical sensor based on a glassy carbon electrode (GCE) modified by a thin film of hybrid copper cobalt hexacyanoferrate (Cu-CoHCF) was prepared and tested for the determination of three thiols: L-cysteine (CySH), L-glutathione (GSH) and 1,4-butanedithiol (BdSH). Cyclic voltammetry (CV) measurements were carried out with the as prepared and thermally treated chemically modified electrode (CME) in phosphate buffer solution from pH 2 to 7. From the CV measurements, it was concluded that at pH higher than 5, the Cu-CoHCF layer was unstable and underwent significant fouling when biased at a potential at which the three thiols were electrocatalytically oxidized. Following the preliminary CVs chronoamperometric measurements were carried out to determine the optimum conditions to develop an analytical method for the determination of thiols. Cysteine showed the lowest limit of detection ( $7.5 \times 10^{-7}$  M), but very low values were displayed also by GSH ( $2.5 \times 10^{-6}$  M) and BdSH ( $2.0 \times 10^{-6}$  M). The range of linearity extended up to  $6.0 \times 10^{-5}$  M for CySH,  $9.0 \times 10^{-5}$  M for GSH and  $1.2 \times 10^{-4}$  M for BdSH without significant fouling of the CME. The analytical method was applied to the determination of GSH in a nutraceutical purchased from the local market.

**Keywords:** Hexacyanoferrates, Electrosynthesis, Glassy carbon, L-Cysteine, 1,4-Butanedithiol, L-Glutathione

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