

Synthesis of Cu₂O/CuO Nanomaterials for Enzymeless Amperometric Detection of Glucose

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A one-pot approach has been developed for the preparation of Cu₂O nanocubes from cupric nitrate in alkaline aqueous solutions containing fructose and ascorbic acid at 32 degrees Celsius. In the presence of cetyltrimethylammonium bromide, Cu₂O nanocubes and Cu²⁺ ions react to form Cu₂O/CuO nanomaterials. Relative to Cu₂O nanocubes, Cu₂O/CuO nanomaterials possess higher electrocatalytic activity for glucose oxidation. The enzymeless Cu₂O/CuO electrode allows sensitive detection of glucose, with linearity of the current at 0.6 V vs. Ag/AgCl against glucose concentration over the range of 0-5 mM ($R^2 = 0.99$). The Cu₂O/CuO nanomaterial modified electrode has been validated by determination of the concentrations of glucose in serum samples, with a result that is not significantly different from that obtained by a commercial glucose device. We have found that the stable and low-cost electrode can be used for at least 60 cycles of cyclic voltammetry measurements.

Awards Won:

Fourth Award of \$500