Simultaneous Voltammetric Determination of Ascorbic Acid, Hydroquinone, Kojic Acid, and Arbutin in Pharmaceutical Samples; a New Approach for Quantitative Determination of Niosomal Formulations Loading Efficiency

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Abstract

Introduction: Arbutin (ABU) inhibits tyrosinase and thus prevents the formation of melanin, therefore, it used as a skin-lightening agent. Ascorbic acid (AA) used in therapeutical fields such as improving immunity, skin disorders, amelioration of injuries and burns. Hydroquinone (HQ) as one of the important skin-bleaching agents used to lighten areas of darkened skin such as freckles, melasma, age spots, and acne scars. Moreover, owing to ability of Kojic acid (KA) in preventing melanin formation, it used in whitening products because of this ability to limit melanin production. Due to the importance of quantitative determination of the four above mention drugs loading efficiency in niosomal formulations, a great attempt was made in the current work to provide a promising sensor using voltammetric techniques.

Methods and Results: BMITB/NiO/NPs/MCPE was prepared by mixing 0.2 g of 1-butyl-3-methylimidazoliumtetrafluoroborate (BMITB) as a binder, 0.8 g of paraffin, 0.1 g of NiO nanoparticles and 0.9 g of graphite powder. The electro-oxidation signals of ABU, KA, AA, and HQ were increased at the surface of modified sensor compared to the bare electrode. The obtained result shows that, at pH 7.0 phosphate buffer (0.1 M), the catalytic oxidation signals exhibited a wide linear range with a satisfactory low detection limit.

Conclusions: The proposed sensor revealed good electrocatalytic activity towards ABU, KA, AA, and HQ. The proposed modified carbon paste electrode (BMITB/NiO/NPs/MCPE) was applied successfully for simultaneous analysis of trace amount of four above mention drugs in niosome carrier real samples.

Keywords: Drug analysis, Voltammetric sensor, NiO nanoparticle, Modified carbon paste electrode.