Utility of Ionic Liquid-based Surfactant in Enhancement of Oxidation Peak Signal of Atorvastatin at Pencil Graphite Electrode

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Abstract:

Background: Atorvastatin (ATOR) is an antihyperlipoproteinemic drug, (3R, 5R)-7-[2-(4-fluorophenyl)-3-phenyl-4-(phenylcarbamoyl)-5-(propan-2-yl)-1H-pyrrol-1-yl]-3,5-dihydroxyheptanoic acid (Fig. 1a). It is used for the treatment of dyslipidemia and for prevention of different cardiovascular disorders. Methods: A simple and sensitive analytical procedure has been developed, optimized and validated by square wave voltammetry (SWV) using pencil graphite electrode (PGE) for the determination of atorvastatin calcium (ATOR) in both pharmaceutical formulation and biological samples. The voltammetric behavior of ATOR is studied using cyclic and square wave voltammetry in the presence of the ionic liquid-based surfactant, 1-tetradecyl-3-methylimidazolium bromide (C14MImBr). Results: The effect of different factors on the oxidation peak current of ATOR have been studied and optimized such as: pH, scan rate and the concentration of C14MImBr. Under optimized conditions in Britton-Robinson buffer (pH 3.3) containing 28 µmol L-1 C14MImBr, a linear response is obtained within the range of 1.34x10⁻⁶ to 10.8x10⁻⁶ mol L⁻¹ ATOR, which is adequate for the quantitation of ATOR in real samples. The limit of detection was found to be 3.70x10⁻⁸ mol L⁻¹. In addition, the developed method was applied to ATOR analysis in Lipitor tablets and spiked urine samples. Conclusion: This study represents the first report of electrochemical analysis of a pharmaceutical compound using ionic liquid-based surfactant. The analytical signal of ATOR is greatly enhanced in the presence of C14MImBr if compared to that obtained using a traditional cationic surfactant cetyltrimethylammonium bromide (CTAB).

Keywords:

Ionic liquid-based surfactant, atorvastatin calcium, square wave voltammetry, pencil graphite electrode, electrochemical analysis, cetyltrimethylammonium bromide (CTAB).

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