PROTEIN OXIDATION BY ELECTROGENERATED HYDROXYL RADICALS

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Many chronic diseases are associated to oxidative stress that can result from the unbalance between the production of reactive oxygen species and the action of antioxidant defense systems. Proteins are important targets as they are major components of cells. Modification of proteins structure, function and stability can result from the attack by different radicals, e.g. $O_2^{\cdot-}$ or HO.

In order to characterize the damages caused by these radicals it is important to analyze the proteins oxidation products obtained from assays where radicals are generated by clean processes [1]. In this context the electrochemical generation of hydroxyl radicals can provide an alternative method, where these radicals are formed as intermediate in the oxidation of water to produce oxygen. Anodes of different materials, such as of boron doped diamond electrodes (BDD) and platinum (Pt), can be used for this purpose [3].

In this work it is considered the use of high reactive HO radicals (weakly adsorbed at BDD) and of low reactive HO radicals (strongly adsorbed at Pt) to oxidize BSA.

The extension of BSA oxidation is analyzed for different experimental conditions, such as current density and electrolyte nature. BSA oxidation is monitored by means of carbonyl groups concentration and by the extension of protein cleavage.

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References:

[1] R.T. Dean, S. Fu, R. Stocker, M.J. Davies, Biochem. J., 324 (1997) 1-18.
[2] G. Xu, M.R. Chance, Chemical Reviews, 107 (2007) 3514-3543.
[3] C. Comninellis, Electrochimica Acta, 39 (1994) 1857-1862.