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Assesment of activity and capacity of antioxidants based on the kinetics of the reaction with electrogenerated HO radicals

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The antioxidants action is based on their reaction with reactive species such as ROS (reactive oxygen species) and RNS (reactive nitrogen species). These reactions involve either electron transfer processes (reducing action) or capture of radicals (scavenger action). The characterization of antioxidants (AOs) has stimulated the development of different analytical approaches [1]. In general the methods that aim to characterize their action as radicals scavenger are based on in situ generation of radicals and the monitoring of reactions between radicals and AOs to be characterized.

In these methods the generation of radicals is a critical step, both concerning their nature (be chemically relevant) and the process used for their generation. In this respect, the use of radicals such as peroxy (ROO^\bullet), superoxide ($\text{O}_2^{\bullet-}$) and hydroxyl (HO^\bullet) is preferred over the use of synthetic radicals as DPPH or ABTS. The HO radical, used by several methods, can be generated by different approaches, e.g. H_2O_2 photolysis, oxygen electrocatalytic reduction and Fenton or Fenton-type reactions. It is known that HO radicals can be generated electrochemically by the oxidation of water. Hydroxyl radicals formed using Pt are strongly adsorbed at the anode surface and their reaction kinetics depends markedly on the reactivity of the chemical species. In this way, by monitoring the concentration decay of an AO it is possible to characterize their reactivity as radical scavengers [2].

In this paper we presented an analytical method for characterizing the antioxidant activity / capacity of chemical species using HO radicals electrochemically generated from galvanostatic electrolysis using two alternative approaches. In the first approach the consumption of antioxidants is evaluated, whereas in the second approach the consumption of an optical probe is evaluated.

[1] D Huang, B Ou and RL Prior, *J Agric Food Chem*, 2005, 53, 1841–56

[2] R Oliveira, D Geraldo and F Bento, *Electrochim Acta*, in press