THE EFFECT OF CHEMICO-STRUCTURAL FEATURES OF ANTIOXIDANTS ON THEIR ELECTROCHEMICAL RESPONSE AT METAL-BIOPOLYMER NANOCOMPOSITE FILMS

Gabriella Di Carlo, Antonella Curulli, Alessandro Trani, Gabriel M. Ingo, Daniela Zane
Institute for the Study of Nanostructured Materials (ISMN) - CNR Via del Castro Laurenziano 7 00161 Roma (Italy

Natural antioxidants are species of great interest in many areas, as food chemistry, health care and clinical applications. They have beneficial effects on human health and could play an important biological role in the prevention and treatment of many pathologies (as cardiovascular disorders, cancer, diabetes, inflammation, arthritis, etc.).[1] The classification of antioxidants is commonly carried out on the basis of the chemical structure that determine their reactivity. However, their antioxidant action is also strictly related to the redox properties and consequently the knowledge of the latter is very crucial for a better understanding of antioxidant capacity. To this purpose, an electrochemical study is required to correlate chemical structure, activity and redox behaviour of antioxidants

In this work, the redox behaviour of structurally related antioxidants, such as catechol, hydroxycinnamic acid and flavonoid derivatives, has been investigated at electrode surfaces modified with different gold nanoparticles (AuNPs) – chitosan films. Our findings demonstrate that the chemical structural features of the antioxidants play a key role in the interaction with modified electrodes that strongly affect the electrochemical response. In particular, a better response was observed for molecules with two hydroxyl groups in ortho position of the catechol ring and with a low steric hindrance. However, the redox behaviour cannot be explained only on these bases, since the nanostructure and surface functional groups of AuNPs-chitosan modified electrodes have also to be considered. The presence of interconnected metal nanoparticles into chitosan film strongly affect the electron transfer properties, whereas the surface functional groups can promote the interaction with selected antioxidants acting as scavenger.

The understanding of the key factors that affect the electrochemical response of antioxidants at electrode surface modified with nanostructured hybrid films is a key issue and could significantly contribute to the development of highly efficient electrochemical sensors.

[1] Rice-Evans, C. A.; Miller, N. J.; Paganga, G. *Free Radical Biol. Med.* **1996**, *20*, 933-956.