

International Workshop on Bioinorganic Redox Control

Implications for Medicinal Chemistry and Environmental Protection



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Book of abstracts

BIOINORGANIC REDOX CONTROL

International Workshop on
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Protection”

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APPLICATION OF METALS AND METAL OXIDES NANOPARTICLES IN ANTIOXIDANT ACTIVITY STUDIES OF OILS SEEDS AND CONSUMPTION OILS FROM THE DIFFERENT STAGES OF PRODUCTION

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There is a new research trend focused on the development of new methods for antioxidant capacity determination of rapeseed, intermediate- and by-products, as well as oils from various stages of the refining process based on the formation of color solutions of metals and metal oxide nanoparticles. A new analytical methods are based on the reduction of metal ions to the corresponding metal and metal oxide nanoparticles in the optimized conditions.

Amount of the synthesized nanoparticles by antioxidants present in extracts was determined by measuring the absorbance intensity of the characteristic band in the visible region. The band is attributed to the collective oscillation of electron gas in the particles with a periodic change in the electronic density at the surface, known as plasmon surface resonance. These properties depend on the type of nanoparticles, their size, shape of the core and distance between the generated nanoparticles form clusters in solution. Therefore these unique properties of metals in "nano" scale were applied for development of analytical methods for determination of antioxidant capacity of rapeseed and its products. The proposed new analytical procedures can be called "green", because they require only safe and non-toxic chemicals.

These fast, easy, and inexpensive analytical methods to determine antioxidant capacity will permit on the improvement of technological process and enhance the quality of the final product and by-products. Studied methods of antioxidant activity (AA) based on metals nanoparticles are (MN) are fast, simple with acceptable precision (RSD = 1.05 – 3.63%), accurate (recovery = 94.2 – 104.6%) and sensitive ($\epsilon = 1.2 \times 10^3 - 6.3 \times 10^3 \text{ dm}^3/\text{mol cm}$). Presented methods MN can be applied for AC determination in the broader concentration range (0.015 – 2.301 mmol SA/mL) than typical ones: FRAP (0.001 – 0.015 mmol SA/mL), DPPH (0.02 – 0.160 mmol SA/mL), ABTS (0.014 – 0.118 mmol SA/mL) and FC (0.004 – 0.059 mmol SA/mL).

Further studies will be focused on preparation of the new universal methods for determination of the total antioxidant power of oil samples based on formation of coloured nanoparticles of metals or metal oxides.