Current Topics in Biophysics vol. 29(1-2), 2005, 95-100

EPR Study of Photoinduced and O₂-Dependent Changes in Gallic Acid-Derived Model Humic Substances.

Anna Pawlak, Krzysztof Polewski, Danuta Sławińska, Janusz Sławiński

Paramagnetic properties of model humic substances (HS) synthesized from 3,4,5-trihydroxybenzoic acid (gallic acid) were studied by means of EPR spectroscopy. A singlet EPR signal without any fine structure was observed for powder sample with spin density 6×10^{18} spin/g, width 6.45 Gs and g=2.002. Results of the microwave power saturation pointed to a high dipolar relaxation enhancement. In aqueous solutions a ,,dark" EPR signal depends on atmosphere and pH. The shapes of EPR spectra are very similar to those of melanins and humic acids indicating on the semiquinone as the possible source of the signal. Light induced (wavelengths 290-600 nm) spectra and kinetics of the EPR signal amplitude appeared to be O₂, pH and wavelengths dependent suggesting slow oxidative degradation of paramagnetic centers in the HS. The relevance of these data to environmental photophysical and photochemical processes associated with the multiplicity conservation and spin-spin interaction of HS and O₂ are shortly discussed.