

ESR (Electron Spin Resonance) method to control the interaction of magnetic nanoparticles with cells

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The application of nanomaterials is studied in many fields. In medicine they are considered, among others, as drug carriers. Magnetic nanoparticles are of particular interest in this field. This is possible due to their magnetic properties. ESR (Electron Spin Resonance) is a method that allows to study their magnetic properties, control their quality, taking into account the fact that a drug is attached to their surface, and their influence on biological material (cells). Based on temperature measurements, their superparamagnetism can be confirmed. By increasing the resolution of the ESR spectra, it is possible to obtain precise information on the surface of nanoparticles (surface defects). Nanoparticles can be functionalized by attaching selected drugs to their surfaces. These can be spin labels that act as free radicals scavengers. In this case, based on the ESR spectra, two sources of information are obtained: one about the magnetic core and its properties, and the other, from the attached spin label, about what is happening on the surface of nanoparticles. The analysis of ESR signals allows obtaining information on how nanoparticles are affected by the environment in which they are located and what interactions take place between them and, for example, the cells to which they are added. All these issues are shown in the paper.

References:

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