EPR spectroscopy for evaluation of oxygen permeability into encapsulated oils

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Analytical technology in food and agriculture

Encapsulation is a commonly used method for protection of oxidation sensitive polyunsaturated fatty acids during storage. The encapsulated oils are assumed to be protected by inclusion into a solid matrix that is impermeable to oxygen. Encapsulated oils are often produced as powders, where testing the actual oxygen impermeability is a challenge due to the micrometer sizes of the particles. Electron Paramagnetic Resonance Spectroscopy, EPR, can in combination with the use of stable nitroxyl radicals be used to evaluate the oxygen barrier properties in encapsulation powder particles. The experimental principles of the methodology, which is based on line-broadening due to spin exchange with paramagnetic oxygen, will be described and examples of testing the oxygen barrieres of particles made with different encapsulation methods will be presented.