Title:

Applications of CW-EPR for in Food Irradiation Control and R&D

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Abstract:

Electron Paramagnetic Resonance (EPR) spectroscopy has a long tradition in food science, especially related to food irradiation control. Recently, EPR has also gained attention in other fields, related to antioxidant research as well as the characterization of diary products like tea, wine and vegetable oil.

EPR, also referred to as Electron Spin Resonance (ESR) or Electron Magnetic Resonance (EMR), is the only direct method to detect free radicals or other paramagnetic species. Bruker offers routine research systems as well as the e-scan, a dedicated table-top EPR scanner.

Food irradiation control helps in consumer protection. European Union (EU) directives clearly require irradiated food to be labelled with the Radura symbol. Further, national authorities are responsible for a clearing list of irradiated food. Therefore, national or federal bodies are obliged to control food according to EU guidelines. Three EU norms exist where EPR is used to identify irradiated food.

Antioxidant capabilities are also readily characterized by EPR with the help of the DPPH-assay (1,1-Diphenyl-2-picrylhydrazyl). This method is related to the commonly known 'Red Wine Paradox' in the case of dairy food. The antioxidant itself is EPR-silent. However, it will inactivate the dissolved DPPH radical. Thus, the more effective the antioxidant, the faster the DPPH radical signal decays. The unique combination of an e-scan with a proprietary resonator (AquaFlow™) and a liquid autosampler greatly increases sample throughput and reproducibility. In the example, the DPPH-assay reveals differences in the antioxidative activity of green tea vs. sake vs. red and white wine.

The presentation will highlight key examples of EPR applications in food science with particular emphasis on the food irradiation control as well as automation tools for antioxidant analysis by EPR.