Rapid Determination of Degradation in Frying Oils with FT-NIR

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Increasing measures of free fatty acids (FFA), total polar materials (TPM), polymerized triacylglycerols (PTG) darkening colour as well as decrease of iodine value, dielectricity constant or linoleic/palmitic acid ratio are typical indices of oil degradation at elevated temperatures. The frying industry uses only some of these parameters to predict the quality of oil in deep-fat fryers or the products to be fried

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The most objective and reliable methods TPM and PTG need a laboratory equipment and hazardous chemicals. Thus, these indexes are more often used in research studies rather than in regular quality control.

Since a few years many quick tests are available on the market indicating the polar materials by measuring dielectricity. Besides FFA these quicktests are more and more applied in frying industry.

Near-infrared spectroscopy (NIRS) is a clean, fast, and nondestructive technique to analyse fats and oils and found to be the optimal tool to describe all aspects of the fat degradation . Previous studies were limited because the degradation was done in the lab by heating and purging the oil with air often without frying food . Furthermore, the number of samples was small.

Therefore, more than 300 used deep frying fats collected from the food inspection and frying industry were analysed using transmittance NIRS, two quick tests, and standardized laboratory methods (FFA, TPM, PTG, anisidine value, fatty acid composition) . The analysed samples covered the whole range of fat degradation and composition.

The statistical evaluation shows that transmittance NIRS measuring FFA, polar materials, andesine value and polymerized TAGs has strong correlations with the known official lab methods. The fact that the most important parameters of oxidation and polymerization may be determined simultaneously makes NIRS a potentially valuable tool for food quality assurance and for health authorities to check the degree of degradation.