MARGARINE QUALITY MONITORING BASED ON REFLECTANCE SPECTROSCOPY

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Abstract:

Margarine is a term that can indicate any of a wide range of butter substitutes. Due the raw material great diversity, margarine end-product quality characteristics are expected to be highly diversified. This article proposes the use of reflectance UV-VIS-SWNIR spectroscopy to monitor the margarine end-product quality properties. The main effort in this work was the development of a fast monitoring procedure to assess the quality of the manufactured margarines.

The study was performed on two margarine products: regular margarine (<80% fat) and reduced-fat margarine (<60% fat). The nine product samples were collected during the production line normal operating conditions on different days. The samples had the surface cleaned in order to remove any sign of oxidized material. Then, spectra were collected by a reflectance probe normal to the sample surface. The samples temperature was recorded (10.0 ± 2.0ºC) and the probe-sample distance was kept constant for all the samples. The integration time was set to 40s for the collection of the five UV/VIS spectra per samples; the three VIS/NIR spectra per sample were collected using a 10s integration time.

The data analysis was performed on each product and for each spectral range independently. The spectra were normalized by its maximum intensity and the corrected for using a robust multiplicative scatter correction algorithm. A principal component analysis was performed to the pre-process spectra and the multivariate statistical process control limits were determined with bootstrap for each product/spectral range.

Results show that UV-VIS-SWNIR reflectance spectroscopy provides a quick and fast assessment of these products characteristics and thus it can be used as an indication of the overall product variability with can be plotted into a multivariate control chart.