Application of Interferometric Techniques for Quality Control Oils Used in the Food Industry

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Abstract : The purpose of this project is to propose a quick and environmentally friendly alternative to measure the quality of oils used in food industry. There is evidence that repeated and indiscriminate use of oils in food processing cause physicochemical changes with formation of potentially toxic compounds that can affect the health of consumers and cause organoleptic changes. In order to assess the quality of oils, non-destructive optical techniques such as Interferometry offer a rapid alternative to the use of reagents, using only the interaction of light on the oil. Through this project, we used interferograms of samples of oil placed under different heating conditions to establish the changes in their quality. These interferograms were obtained by means of a Mach-Zehnder Interferometer using a beam of light from a HeNe laser of 10mW at 632.8nm. Each interferogram was captured, analyzed and measured full width at half-maximum (FWHM) using the software from Amcap and ImageJ. The total of FWHMs was organized in three groups. It was observed that the average obtained from each of the FWHMs of group A shows a behavior that is almost linear, therefore it is probable that the exposure time is not relevant when the oil is kept under constant temperature. Group B exhibits a slight exponential model when temperature raises between 373 K and 393 K. Results of the t-Student show a probability of 95% (0.05) of the existence of variation in the molecular composition of both samples. Furthermore, we found a correlation between the Iodine Indexes (Physicochemical Analysis) and the Interferograms (Optical Analysis) of group C. Based on these results, this project highlights the importance of the quality of the oils used in food industry and shows how Interferometry can be a useful tool for this purpose.

Keywords : food industry, interferometric, oils, quality control
Conference Title : ICFSN 2015 : International Conference on Food Science and Nutrition
Conference Location : Paris, France
Conference Dates : August 27-28, 2015