

Oxidation and Thermal Degradation Analysis with Thermal and Chemical Spectroscopy Techniques

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In general, all vegetable oils are easily oxidated due to the presence of double bonds that can lead to the formation of peroxides. The oxidation products easily polymerize forming aldehydes, cetones, alcohols, etc. This process is enhanced by light, heat, humidity, and the presence of fatty acids. In addition, the oxidation can be catalyzed by inorganic elements such copper and iron that can be present as impurities in the virgin oil due to its preparation, handling and storing. All these factors together can contribute to the reduction of the mean life time of the oil and on its organoleptic properties. We have applied photopyroelectric spectroscopy and selected chemical analyses to study the oxidation and degradation of vegetable and edible oils such sunflower and olive. We obtained accurate results giving us good degradation estimation and material generation quantification. We made trials of six thermally treated samples for each oil studied beginning at 25 °C, room temperature, until 175 °C (with 30 degree intervals; meaning 25, 55, 85, 115, 145 and 175 °C). The highest temperature was selected as a typical frying and cooking temperature. We found good correlation between the thermal effusivity results and the direct injection mass spectrometry made on each sample trial.

We greatly acknowledge the partial financial support to this work to the Consejo Nacional de Ciencia y Tecnologia, to Universidad Autónoma de la Ciudad de México and to Sistema Nacional de Investigadores.