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PHOTONICS spectra

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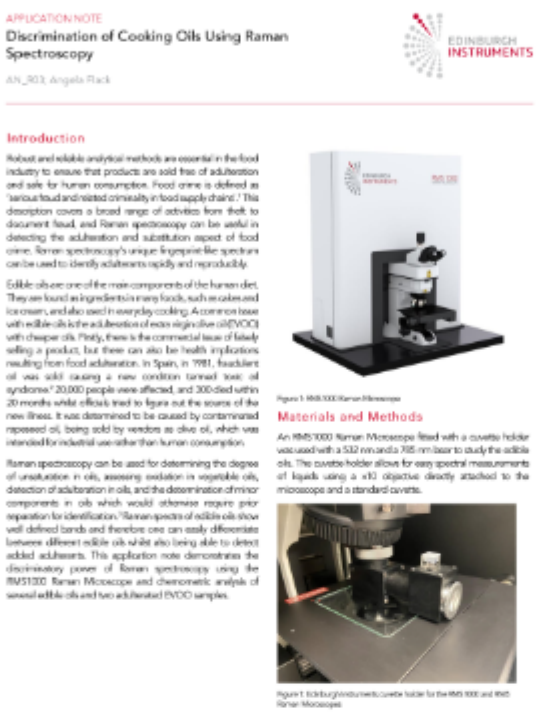
APPLICATION NOTE

Discrimination of Cooking Oils Using Raman Spectroscopy

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Introduction

Robust and reliable analytical methods are essential in the food industry to ensure that products are sold free of adulteration and safe for human consumption. Food crime is defined as 'serious fraud and related criminality in food supply chains'. This description covers a broad range of activities from theft to document fraud, and Raman spectroscopy can be useful in detecting the adulteration and substitution aspect of food crime. Raman spectroscopy's unique fingerprint-like spectrum can be used to identify adulterants rapidly and reproducibly.

Edible oils are one of the main components of the human diet. They are found as ingredients in many foods, such as cakes and ice cream, and also used in everyday cooking. A common issue with edible oils is the adulteration of extra virgin olive oil (EVOO) with cheaper oils. Firstly, there is the commercial issue of falsely selling a product, but there can also be health implications resulting from food adulteration. In Spain, in 1981, fraudulent oil was sold causing a new condition termed 'toxic oil syndrome'. 20,000 people were affected, and 300 died within 20 months whilst officials tried to figure out the source of the new illness. It was determined to be caused by contaminated rapeseed oil, being sold by vendors as olive oil, which was intended for industrial use rather than human consumption.

Raman spectroscopy can be used for determining the degree of unsaturation in oils, assessing oxidation in vegetable oils, detection of adulteration in oils, and the determination of minor components in oils which would otherwise require prior separation for identification.[1] Raman spectra of edible oils show well defined bands and therefore one can easily differentiate between different edible oils whilst also being able to detect added adulterants. This application note demonstrates the discriminatory power of Raman spectroscopy using the RMS1000 Raman Microscope and chemometric analysis of several edible oils and two adulterated EVOO samples.

Figure 1: RMS1000 Raman Microscope

Materials and Methods

An RMS1000 Raman Microscope fitted with a cuvette holder was used with a 532 nm and a 785 nm laser to study the edible oils. The cuvette holder allows for easy spectral measurements of liquids using a x10 objective directly attached to the microscope and a standard cuvette.

Figure 2: Edinburgh Instruments cuvette holder for the RMS1000 and RM5 Raman Microscopes

Discrimination of Cooking Oils Using Raman Spectroscopy

In this application note, Edinburgh Instruments highlights how Raman spectroscopy, in combination with chemometrics, can be used to identify cooking oil adulteration.

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