

# Peroxides Detection in Extra Virgin Olive Oil (EVOO) by plasmonic nanoholes transducers

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*Evaluation of the peroxides concentration in EVOO have been performed by monitoring the variation in the plasmonic resonance of a suitable nanoholes structure and comparison the results with laboratory standard methodologies.*

**Keywords:** nanoplasmonic; peroxides, EVOO

## 1. Introduction

Recently, a very large effort has been invested into nanofabrication approaches allowing fast, reproducible and parallel surface patterning at the large area nanoscale. Here, a simple and reproducible approach for the fabrication of large area highly ordered array of plasmonic metal nanostructured surfaces by nano-sphere lithography (NSL) is presented. Based on the self-assembling of close-packed polystyrene (PS) particles, at air/water interface, this cost-effective approach enables the fabrication of large-area and transferrable colloidal mask with a high quality crystal-like structure. Related optical properties are monitored by UV-Vis spectroscopy and application in the quality control of extra virgin olive oil (EVOO) are performed. In particular, analysis of peroxides concentration is evaluated. Peroxides are products generated from the oxidative degradation of polyunsaturated fatty acids in the oil. They build up slowly over time contributing towards oil rancidity, resulting in undesirable flavours and odours. Their identification provides useful information about oil conservation and rancidity. In particular, a general overview of the relative level of Peroxide Values (PV) in EVOO and its likely condition could be: < 7 meqO<sub>2</sub>/kg = excellent quality; 7÷15 meqO<sub>2</sub>/kg = good quality; 15÷20 meqO<sub>2</sub>/kg = poor quality; >20 meqO<sub>2</sub>/kg = rancid oil.

In this paper, evaluation of the peroxides concentration has been performed by monitoring the variation in the plasmonic resonance of a suitable nanohole structure and comparison the results with laboratory standard methodologies.

## 2. Plasmonic Transducers preparation

Ordered NH array prepared by NSL were obtained by a very simple and reproducible bottom-up approach based on the preparation of self-assembled monolayers of close-packed polystyrene particles of 500 nm in size on liquid surface. This method enables the creation of highly ordered colloidal crystals onto glass substrates. Successive thermal evaporation

of gold and removing of the nanosphere give us a nanoholes transducers .

## 3. Morphological and Optical characterization

Gold NH arrays support both localized and propagating surface plasmon resonances (PSPR and LSPR modes). The fabricated NHs (fig.1a) are characterized by a diameter of 350 nm and a periodicity of 500 nm. However, if the ordered NH array present a sufficient periodicity, also propagating surface plasmon polariton (SPP) modes can be excited by the incident light, leading to an extraordinary optical transmission (EOT) of the sample [1,2].

## 4. Results and discussion

Optical characterization is reported in fig. 1b. The position of the Localized Surface Plasmon Resonance peak (LSPR) versus the concentration of peroxides in EVOO has been monitored give us a new and fast methodology to detect peroxides concentration.

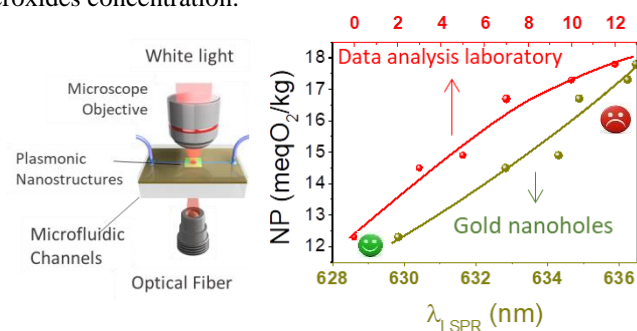


Fig.1. a) Experimental scheme. B) optical measurements

## References

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