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## **In-the-field determination of free acidity in olive oil using a portable battery-operated sensor system**

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Olive oil quality grade is assessed by legal conformity check of chemical and sensory parameters and free acidity is the first of them. The official method to determine free acidity is by means of a titration carried out in a proper laboratory by trained personnel.

An alternative technique that can provide fast and accurate determination of oil free acidity is the electrical conductance measurement of an emulsion between an hydro-alcoholic solution and the sample under test. This method has the advantage to be implementable in automatic form and to use non toxic reagents that can be easily disposed of.

A portable battery operated sensor system has been designed and built making possible the free acidity measurement in about 30 seconds. The proposed system has been in-house validated using 30 olive oil samples with a satisfactory performance in terms of LOD, LOQ, precision and accuracy. This tool can be used on-site in production environment (e.g. oil mills or packaging centers) by anyone. The system (with dimensions 11 x 15 x 5 cm) can be powered by 3 AAA alkaline batteries or by a PC USB port. It is made of a PCB electronic board that integrates a microcontroller (STM32L152RCT6A) and all the electronics to perform the measurements. The sample is hosted in a modified 50 mL vial that features two cap-shaped stainless steel electrodes for the electrical conductance measurement.

The proposed instrument is potentially of great interest for small production centers that cannot afford an internal laboratory for quality analysis and send the samples to an external laboratory with high costs and time needed.

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