DEVELOPMENT OF OPTICAL SENSORS FOR FOOD QUALITY CONTROL

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The continuous development of the global food industry has been accompanied by increasing requirements for food safety and quality, high-throughput detection technologies based on intelligent optical sensors have gained significant attention in food quality assessment.

In this work, a novel optical sensor for the determination of volatile acidity (VA) and total acidity (TA) in real-world samples is presented. The sensor is based on the kinetic principles of heterogeneous solid-phase reactions, in which diffusion-controlled processes govern the reaction rate, enabling the development of an innovative calibration method for an optically responsive paper membrane (Paper-FM). The Paper-FM was synthesized by the covalent immobilization of the pH-probe Nile Blue on a porous cellulose paper membrane. The resulting sensor allows simultaneous dual (fluorescent and colorimetric) quantification of total acidity (% w/v of tartaric acid) and volatile acidity (% w/v of acetic acid) of wines and total acidity (% w/v of acetic acid) of vinegar. Notably, the determination of volatile acidity in wines avoids the conventional, labor-intensive procedure involving vapor rectification.

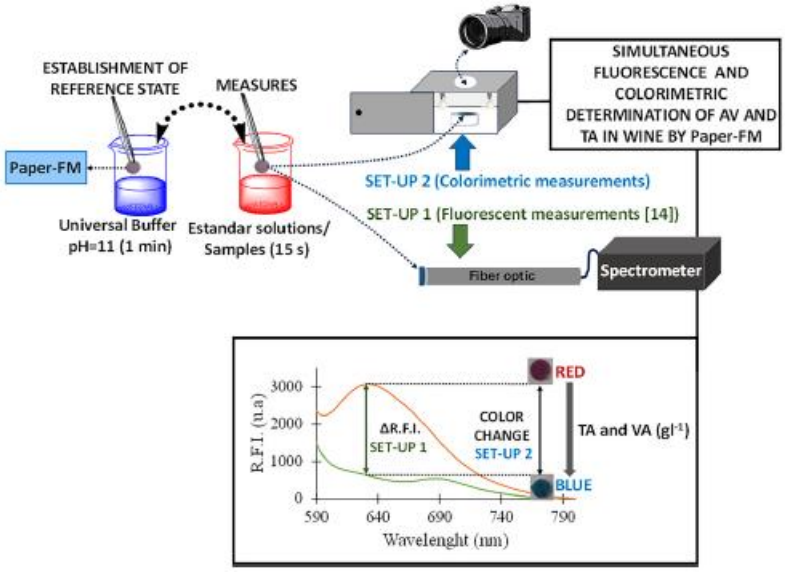

Fig. 1.Schematic of the measurement protocol of the TA and VA with both setsups (colorimetric and fluorescent) using Paper-FM.

This optical sensor is environmentally friendly, as, unlike titration methods, it does not generate toxic waste and is reversible and extremely stable offering a valuable tool for process and quality control.

Keywords: optical fiber sensor, fluorescent pH-probe, paper membrane, wine, vinegar, total acidity.

References:

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