SENSITIVITY AND CLASSIFICATION PERFORMANCES OF A NEW MULTIWAVELENGTH LIF SPECTROSCOPY APPARATUS FOR BIOLOGICAL AGENT ANALYSIS

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Laser-Induced Fluorescence (LIF) spectroscopy is a technique that allows to analyse complex biological systems. It has great potentialities in detecting the presence of specific atoms, molecules and agents in various media. Fast biological agent detection and identification, such as viruses and bacteria, is of great interest in the fields of clinics and environmental monitoring, especially in taking proper countermeasures in short times. However, similar agents usually share similar LIF spectra and their discrimination is a very challenging task. For this purpose, the increase in spectral information is crucial. The LIF spectra are strongly influenced by the wavelength of the excitation light and by a multi excitation approach it is possible to increase the spectral information and making the identification easier. Moreover, the average concentration of agents in the environment is usually low, implying very low fluorescence signals. In this work, the authors present a new multiwavelength LIF apparatus for the analysis of biological samples. The new apparatus has four excitation wavelengths and a spectrometer with large sensitivity and integration time are used to increase the minimum detectable concentration. The sensitivities and the classification performances of several biological agents are evaluated.