

A Portable Fluorescence Sensing Device for On-site Sensing Applications

Fluorescence spectroscopy plays an important role in biosensing and chemical sensing applications because of various advantages, for instance, high sensitivity and low electrical interferences. Even though the technique often provides very low limits of detection, the high cost and bulkiness of commercial fluorescence spectrophotometers are key limitations that keep most fluorescence based bio- and chemical sensors to be used only at a laboratory scale. In this work, we present the development of a portable fluorescence sensing device to overcome the limitations. A light emitting diode (LED) with the center wavelength around 460 nm is used as a the light source providing an excitation light for popular fluorophores, such as fluorescein and Alexa488, with absorption peaks around 460-500 nm. The intensity of the LED is adjustable and stable for at least 2 hours by using a constant current circuit. A long pass filter is used to screen out the excitation light before the emission light from the fluorophore is recorded by a smartphone camera. The fluorescence intensity is reported in terms of RGB values. Using this concept, our device is capable of measuring fluorescence intensity from multiple fluorophores that have well separated peaks such as what are often used in Förster resonance energy transfer (FRET) based sensors. The performance of the device is slightly inferior to that of a commercial spectrofluorometer but is orders of magnitudes lower in cost and weight. We believe that our device holds great potential for on-site bio- and chemical sensing applications.

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