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# Wireless Fluorimeter for Mobile and Low Cost Chemical Sensing: A Paper Based Chloride Assay

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## Abstract

Wireless chemical sensors are increasingly finding use as analytical devices in healthcare diagnostics, wearable sensing (sweat analysis) and in the rapidly emerging area of the *Sensor Internet of Things* (SIoT). In such wireless scenarios, the application of fluorescence-based sensors is lagging behind other types of transduction mechanisms. In this work a new low-cost and highly portable wireless fluorimeter for optical chemical fluorescence intensity measurements is presented (*bill-of-materials* approximately €20). The fluorimeter is programmed and communicates wirelessly with mobile devices or personal computers by radio-frequency identification (RFID) or near-field communication (NFC). This novel mobile analytical system is highly adaptable for use with different fluorescent sensor chemistries and analytes. The fluorimeter has been evaluated in the laboratory in two sets of *proof-of-concept* experiments: firstly fluorimetry in solution, where the fluorescence intensities of fluorescein were recorded, and secondly chloride sensing via a paper-immobilised quinine sulphate fluorescent indicator. The latter represents the first demonstration of wireless (radio-frequency) fluorescence-based chloride sensing. Satisfactory analytical performance was achieved in the entire range of sweat chloride concentrations. The wireless fluorimeter system presented here could make a significant contribution to several emerging areas of mobile chemical sensor research, including wearable sensors for healthcare and sport, mobile point-of-sample diagnostics as well as more generally for the Sensor Internet of Things.

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