

Colorimetric Based pH Sensing Using a Smartphone

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Abstract— Utilizing the camera of a smartphone, we demonstrate the working of a colorimetric based pH sensor. The robust hardware of the smartphone camera (iPhone 4, Apple Inc.) has been integrated with simple laboratory optical components to design a visible spectrophotometer with spectral resolution of 0.334nm/pixel. Colorless pH media of different pH values have been treated with bromophenol blue and bromocresol green indicator dyes and the spectroscopic change in image spectrum is recorded by CMOS detector of the smartphone camera. For validation, the characteristic transmission spectra of the dye-treated pH samples have been measured using a standard spectrophotometer (UV 2450, SHIMADZU). The characteristic transmission spectral response showed by the designed smartphone sensor showed consistent results with respect to that of the standard spectrophotometer device. The designed sensor can detect acidity and basicity of colourless aqueous media under different pH conditions. The sensor has the ability to detect change in pH value as low as 1 pH unit or even less. Thus, a compact, light weight and relatively inexpensive smartphone based pH sensor is proposed.

Keywords: Smartphone, spectrometer, pH indicator dye, spectroscopy, transmission spectrum.