Parallelized metals detection by a paper-based microfluidic device and smartphone

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Abstract

Portable electronic devices and wireless communication enable a broad range of applications including environmental surveillance, food safety monitoring and point-of-care testing. Particularly, by incorporating smartphone and microfluidic paper-based device, rapid analysis, mobile laboratories for chemical assay, remote sensing and data management become more available. In this work, we designed and fabricated a 12-unit paper chip for colorimetric detection of Fe, Ni, Cu and Co. Cellphone's camera was used to capture colorimetric images, and then the RGB values of the color images were converted to grayscale *via* a custom designed app. The intensity reflecting metal concentrations were processed and analyzed by the same app and a remote server. Log-linear calibration curves were generated for each metal, with method detection limits ranging from 0.8 to 1.2 μg for each metal. The presented device and data processing tools hold a potential to assist mobile sensing, pollution detection and healthcare in low-resource areas.

Keywords: Paper-based microfluidics, Smartphone image processing, Metals detection