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Improved assessment of accuracy and performance using a rotational paper-based device for multiplexed detection of heavy metals

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Abstract

In this work, a novel rotational microfluidic paper-based device was developed to improve the accuracy and performance of the multiplexed colorimetric detection by effectively avoiding the diffusion of colorimetric reagent on the detection zone. The integrated paper-based rotational valves were used to control the connection or disconnection between detection zones and fluid channels. Based on the manipulation of the rotational valves, this rotational paper-based device could prevent the random diffusion of colorimetric reagent and reduce the error of quantitative analysis considerably. The multiplexed colorimetric detection of heavy metals Ni(II), Cu(II) and Cr(VI) were implemented on the rotational device and the detection limits could be found to be 4.8, 1.6, and 0.18 mg/L, respectively. The developed rotational device showed the great advantage in improving the detection accuracy and was expected to be a low-cost, portable analytical platform for the on-site detection.

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