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**A selective distance-based paper analytical device for copper(II) determination using a porphyrin derivative**

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**Abstract**

Meso-tetrakis(1,2-dimethylpyrazolium-4-yl)porphyrin sulfonate (TDMPzP), a water-soluble porphyrin derivative, was synthesized and used as a colorimetric reagent for Cu<sup>2+</sup> detection on a microfluidic paper-based analytical device ( $\mu$ PAD) using distance-based quantification. TDMPzP showed a high selectivity for Cu<sup>2+</sup> detection in aqueous solutions. When Cu<sup>2+</sup> was added to the TDMPzP under acidic conditions, a color change from green to a pink was observed by the naked eye. Under optimized conditions, the application of this system to a distance-based  $\mu$ PAD exhibited good analytical response. The presence of common metal ions (Al<sup>3+</sup>, Fe<sup>3+</sup>, Mg<sup>2+</sup>, Co<sup>2+</sup>, Mn<sup>2+</sup>, Zn<sup>2+</sup>, Pb<sup>2+</sup>, Cd<sup>2+</sup>, Sn<sup>2+</sup>, and Ni<sup>2+</sup>) did not interfere with Cu<sup>2+</sup> detection within reasonable tolerance ratios. The lowest concentration of copper that could be measured was 1 mg L<sup>-1</sup> (1 ppm) which meets the requirements for drinking water contamination regulations from the US Environmental Protection Agency (EPA) and World Health Organization (WHO) guidelines for drinking water. Real drinking water samples were analyzed to confirm the practical application of this system and the results showed good agreement with ICP-MS data. This distance-based  $\mu$ PAD based on TDMPzP for Cu<sup>2+</sup> detection is convenient and effective for real-time drinking water analysis.

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