

Accepted Manuscript

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PII: S0925-4005(17)31186-3
DOI: <http://dx.doi.org/doi:10.1016/j.snb.2017.06.167>
Reference: SNB 22638

To appear in: *Sensors and Actuators B*

Received date: 25-4-2017
Revised date: 16-6-2017
Accepted date: 24-6-2017

Please cite this article as: Yuhao Xiong, Linjing Su, Xingcun He, Zhenhua Duan, Zhi Zhang, Zhenlin Chen, Wei Xie, Dongjian Zhu, Yanghe Luo, Colorimetric determination of copper ions based on regulation of the enzyme-mimicking activity of covalent triazine frameworks, *Sensors and Actuators B: Chemical* <http://dx.doi.org/10.1016/j.snb.2017.06.167>

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Colorimetric determination of copper ions based on regulation of the enzyme-mimicking activity of covalent triazine frameworks

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Highlights:

- Covalent triazine framework (CTF) that obtained by a rapid microwave-enhanced high-temperature ionothermal method was used to mimic the skeleton of peroxidase;
- The peroxidase-like activity of Cu²⁺-CTF compound was modulated by the concentration of Cu²⁺;
- A sensitive colorimetric method for copper ions determination was developed based on CTF.

Abstract

Covalent triazine frameworks (CTFs) have garnered increasing interest recently because of their unique structures and properties. However, their application as enzyme mimics for sensing remains unexplored. In this study, an efficient strategy for selective colorimetric detection of Cu²⁺ ions was developed based on CTFs. This strategy relies on the peroxidase-like catalytic activity of CTFs being rationally modulated by Cu²⁺ ions. In the presence of Cu²⁺ ions, the peroxidase-like catalytic activity of the CTF is significantly stimulated and enhanced; this enables the CTF to catalyze the oxidation of the peroxidase substrate 3,3',5,5'-tetramethylbenzidine, which produces a color change from colorless to blue in the presence of H₂O₂. On the basis of the colorimetric method, a good linear relationship for Cu²⁺ ions can be obtained from 1.0 µg/L to 80.0 µg/L, with a limit of detection of 0.05 µg/L. When this

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