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Fe³⁺ doped ZnO-Ag photocatalyst for photoelectrochemical sensing platform of ultrasensitive Hg²⁺ detection using exonuclease III-assisted target recycling and DNAzyme-catalyzed amplification

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Highlights:

- Visible light photocatalyst of Fe³⁺/ZnO-Ag was prepared by atmospheric selfinduction synthesis method as photoactive materials to modify ITO electrode.
- The low concentration of Hg²⁺ could be detected due to the double amplification of exonuclease III-assisted target recycling and DNAzyme biocatalytic precipitation.

ABSTRACT

Herein we designed a novel photoelectrochemical sensing platform based on Fe³⁺ doped ZnO-Ag photocatalyst (Fe³⁺/ZnO-Ag) for ultrasensitive Hg²⁺ detection by using exonuclease III-assisted target recycling and DNAzyme-catalyzed amplification. Firstly, Fe³⁺/ZnO-Ag was synthesized to provide photocurrent under visible light irradiation. Secondly, target Hg²⁺ was determined by hairpin DNA probes on the Fe³⁺/ZnO-Ag modified ITO based on T-Hg²⁺-T, and then Hg²⁺ was released by the digestion of exonuclease III to double-stranded DNA. Finally, the photocurrent markedly decreased due to catalysis of hemin/G-quadruplex toward 4-chloro-1-naphthol. Under optimal conditions, the photocurrents were linearly related to Hg²⁺ concentrations from 0.5 nM to 100 nM with a detection limit of 0.1

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