Simultaneous Detection of Cd²⁺ and Pb²⁺ with a Bismuth Film/Sulfur and Nitrogen Co-Doped Porous Graphene Electrode

Fengping Liu, Wei Huang*, Zhenfa Zhang, Cuizhong Zhang, Qing Huang, Gang Xiang, Meiyang Liang, Jinyun Peng*

College of Chemical and Food Engineering, Guangxi Normal University for Nationalities, Chongzuo, 532200, China

*E-mail: huangwedu641@163.com, pengjinyun@yeah.net

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In this work, a novel electrochemical sensor based on sulfur and nitrogen co-doped porous graphene (SNPG) is developed for the simultaneous detection of Cd²⁺ and Pb²⁺ by in situ plating bismuth film. The large effective surface area and doped sulfur and nitrogen in porous graphene supply active sites with high affinity toward Cd²⁺ and Pb²⁺ by electrostatic interaction to improve the sensor performance, and the bismuth film improves the stripping voltammetric performance by forming bismuth-metal (Cd, Pb) alloys. Under optimized conditions, this sensor exhibits linearity in the range of 0.05-2 µM for Cd²⁺ and Pb²⁺ with a low detection limit of 0.02 µM for Cd²⁺ and 0.008 µM for Pb²⁺. Moreover, the proposed sensor was applied for the simultaneous detection of Cd²⁺ and Pb²⁺ in tap water with satisfactory results, suggesting that SNPG is a promising electrode material for detecting heavy metal ions.

Keywords: electrochemical sensor; sulfur and nitrogen co-doped porous graphene; Cd²⁺; Pb²⁺;

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