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Sensitive and selective Cu²⁺ sensor based on 4-(3-(thiophen-2-yl)-9H-carbazol-9-yl) benzaldehyde (TPCBZ) conjugated copper-complex

By: [Rahman, MM](#) (Rahman, Mohammed M.)^[1,2]; [Alamry, KA](#) (Alamry, Khalid A.)^[2]; [Saleh, TS](#) (Saleh, Tamer S.)^[3]; [Asiri, AM](#) (Asiri, Abdullah M.)^[1,2]

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Abstract

4-(3-(thiophen-2-yl)-9H-carbazol-9-yl) benzaldehyde (TPCBZ) was synthesized under microwave irradiation with auto generated pressure (at 130.0 degrees C) and characterized by H-1 NMR, C-13 NMR, Mass and FTIR spectroscopy, thin-layer chromatography (TLC), and elemental analyses. Here, a thin-layer of TPCBZ onto glassy carbon electrode (GCE) is fabricated with conducting coating agents (5% nafion) to fabricate a selective and selective Cu²⁺ sensor in short response time in phosphate buffer phase. The fabricated sensor (TPCBZ/Nafion/GCE) is exhibited higher sensitivity, large-dynamic concentration ranges, long-term stability, and improved electrochemical performances towards TPCBZ-conjugated copper complex for selective Cu²⁺ sensor. The calibration plot is linear ($r(2): 0.9979$) over the large Cu²⁺ ions concentration ranges (1.0 nM-1.0 mM). The sensitivity and detection limit is similar to 1.12974 μAcm^{-2} μM^{-1} and similar to 0.84 +/- 0.02 nM (signal-to-noise ratio, at a SNR of 3) respectively, which is calculated from the slope of the calibration plot. This novel effort is initiated a well-organize way of efficient cationic sensor improvement with carbazide for heavy metallic pollutants in environmental and health-care fields in large scales. (C) 2016 Elsevier B.V. All rights reserved.

Keywords

Author Keywords: 4-(3-(thiophen-2-yl)-9H-carbazol-9-yl)benzaldehyde (TPCBZ); TPCBZ-Conjugated-copper complex; I-V method; Glassy carbon electrode; Cu²⁺ sensor; Sensitivity

KeyWords Plus: COMPOSITE ADSORBENT; WASTE-WATER; MESOPOROUS ADSORBENT; CARBAZOLE ALKALOIDS; AQUEOUS-SOLUTION; IONS DETECTION; QUANTUM DOTS; TAILOR-MADE; THIN-FILM; REMOVAL

Author Information

Reprint Address: Rahman, MM (reprint author)

King Abdulaziz Univ, CEAMR, POB 80203, Jeddah 21589, Saudi Arabia.

Organization-Enhanced Name(s)

King Abdulaziz University

Addresses:

[1] King Abdulaziz Univ, CEAMR, POB 80203, Jeddah 21589, Saudi Arabia

Organization-Enhanced Name(s)

King Abdulaziz University

[2] King Abdulaziz Univ, Fac Sci, Dept Chem, POB 80203, Jeddah 21589, Saudi Arabia

Organization-Enhanced Name(s)

King Abdulaziz University

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 [3] Univ Jeddah, Fac Sci, Dept Chem, POB 80327, Jeddah 21589, Saudi Arabia

E-mail Addresses: mmrahman@kau.edu.sa

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