



Document details - Synthesis, characterization and catalytic performance of nanostructured dysprosium molybdate catalyst for selective biomolecule detection in biological and pharmaceutical samples

1 of 1

[Export](#) [Download](#) [More... >](#)

Journal of Materials Chemistry B
Volume 7, Issue 33, 2019, Pages 5065-5077

Synthesis, characterization and catalytic performance of nanostructured dysprosium molybdate catalyst for selective biomolecule detection in biological and pharmaceutical samples(Article)

Karthik, R., Mutharani, B., Chen, S.-M., Vinoth Kumar, J., Abinaya, M., Chen, T.-W., Lei, W., Hao, Q.

^aElectroanalysis and Bioelectrochemistry Lab, Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, No. 1, Section 3, Chung-Hsiao East Road, Taipei, 106, Taiwan

^bDepartment of Chemistry, Nanomaterials Laboratory, IRC, Kalasalingam Academy of Research and Education, Krishnankoil, Tamil Nadu, 626 126, India

^cDepartment of Chemistry, VHNSN College (Autonomous), Virudhunagar TN, India

[View additional affiliations](#)

Abstract

The current study reports a new, simple and fast method using a flake-like dysprosium molybdate (Dy_2MoO_6 ; FL-DyM) nanostructured material to detect the antibiotic drug metronidazole (METZ). This nanocomposite material was employed on the surface of a glassy carbon electrode (GCE) to develop the electrode (FL-DyM/GCE). Further, the synthesized FL-DyM was systematically characterized by powder X-ray diffraction (XRD), Raman spectroscopy, scanning electron microscopy (SEM), transmission electron microscopy (TEM), energy-dispersive X-ray diffraction (EDS), elemental mapping, X-ray photoelectron spectroscopy (XPS), and Brunauer-Emmett-Teller (BET) analyses. Cyclic (CV) and differential pulse voltammetry (DPV) techniques were used to study the electrochemical properties. The FL-DyM/GCE-based sensor demonstrated excellent selectivity and sensitivity for the detection of the drug METZ, which could be attributed to the strong affinity of FL-DyM towards the $-NO_2$ group in METZ, and the good electrocatalytic activity and conductivity of FL-DyM. The fabrication and optimization of the working electrode were accomplished with CV and DPV obtained by scan rate and pH studies. Compared to the bare GCE and other rare-earth metal molybdates, the FL-DyM/GCE sensor displayed a superior electrocatalytic activity response for METZ detection. The sensor demonstrated a good linear relationship over the concentration range of 0.01–2363 μM . The quantification and detection limits were found to be 0.010 μM and 0.0030 μM , respectively. The FL-DyM/GCE sensor displayed excellent selectivity, repeatability, reproducibility, and stability for the detection of METZ in human urine and commercial METZ tablet samples, which validates the new technique for efficient drug sensing in practical applications. © 2019 The Royal Society of Chemistry.

Indexed keywords

Engineering controlled terms:

[Dysprosium](#) [Electrochemical sensors](#) [High resolution transmission electron microscopy](#)
[Molybdenum compounds](#) [Nanocatalysts](#) [Nanocomposites](#) [Negative ions](#) [Rare earths](#)
[Scanning electron microscopy](#) [Voltammetry](#) [X ray diffraction](#) [X ray photoelectron spectroscopy](#)

Engineering uncontrolled terms

[Brunauer emmett tellers](#) [Differential pulse voltammetry](#) [Electrocatalytic activity](#)
[Energy dispersive x-ray diffractions](#) [Glassy carbon electrodes](#) [Powder X ray diffraction](#)
[Rare-earth metal molybdates](#) [Selectivity and sensitivity](#)

Engineering main heading:

[Glass membrane electrodes](#)

Cited by 18 documents

Arul, P. , Nandhini, C. , Huang, S.-T.

Development of water-dispersible Dy(III)-based organic framework as a fluorescent and electrochemical probe for quantitative detection of tannic acid in real alcoholic and fruit beverages

 (2023) *Analytica Chimica Acta*

Karuppaiah, B. , Anupriya, J. , Chen, S.M.

An emergent electrochemical sensor based on spinel zinc manganese oxide decorated on amine-functionalized boron nitride for enhanced electrochemical determination of herbicide mesotrione

 (2023) *Process Safety and Environmental Protection*

Karuppaiah, B. , Jeyaraman, A. , Chen, S.-M.

Design and synthesis of nickel-doped cobalt molybdate microrods: An effective electrocatalyst for the determination of antibiotic drug ronidazole

 (2023) *Environmental Research*
[View details of all 18 citations](#)

Inform me when this document is cited in Scopus:

[Set citation alert >](#)
[Set citation feed >](#)

Related documents

Find more related documents in Scopus based on:

[Authors >](#) [Keywords >](#)

EMTREE drug terms:

carbon dysprosium graphite metronidazole molybdenum molybdic acid
nanocomposite

Topic:

Prominence percentile:



EMTREE medical terms:

catalysis chemistry electrochemical analysis electrode human limit of detection pH
procedures reproducibility tablet urine

MeSH:

Carbon Catalysis Dysprosium Electrochemical Techniques Electrodes Graphite
Humans Hydrogen-Ion Concentration Limit of Detection Metronidazole Molybdenum
Nanocomposites Reproducibility of Results Tablets

Chemicals and CAS Registry Numbers:

carbon, 7440-44-0; dysprosium, 7429-91-6; graphite, 7782-42-5; metronidazole, 39322-38-8, 443-48-1; molybdenum, 7439-98-7; molybdic acid, 11116-47-5, 14259-85-9, 7782-91-4;

Carbon; Dysprosium; Graphite; Metronidazole; molybdate; Molybdenum; Tablets

ISSN: 2050750X

CODEN: JMCBD

Source Type: Journal

Original language: English

DOI: 10.1039/c9tb01020c

PubMed ID: 31432868

Document Type: Article

Publisher: Royal Society of Chemistry

Chen, S.-M.; Electroanalysis and Bioelectrochemistry Lab, Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, No. 1, Section 3, Chung-Hsiao East Road, Taipei, Taiwan;

© Copyright 2019 Elsevier B.V., All rights reserved.