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In-situ biofabrication of silver nanoparticles in ceiba pentandra natural fiber using entada spiralis extract with their antibacterial and catalytic dye reduction properties (Article) (Open Access)

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Abstract

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It is believed of great interest to incorporate silver nanoparticles (Ag-NPs) into stable supported materials using biological methods to control the adverse properties of nanoscale particles. In this study, in-situ biofabrication of Ag-NPs using Entada spiralis (E. spiralis) aqueous extract in Ceiba pentandra (C. pentandra) fiber as supporting material was used in which, the E. spiralis extract acted as both reducing and stabilizing agents to incorporate Ag-NPs in the C. pentandra fiber. The properties of Ag-NPs incorporated in the C. pentandra fiber (C. pentandra/Ag-NPs) were characterized using UV-visible spectroscopy (UV-vis), X-ray Diffraction (XRD), Field Emission Transmission Electron Microscope (FETEM), Scanning Electron Microscope (Scanning Electron Microscope (SEM), Energy Dispersive X-ray (EDX), Brunauer-Emmett-Teller (BET), Thermogravimetric (TGA) and Fourier Transform Infrared (FTIR) analyses. The average size of Ag-NPs measured using FETEM image was 4.74 nm spherical in shape. The C. pentandra/Ag-NPs was easily separated after application, and could control the release of Ag-NPs to the environment due to its strong attachment in C. pentandra fiber. The C. pentandra/Ag-NPs exposed good qualitative and quantitative antibacterial activities against Staphylococcus aureus (ATCC 25923), Enterococcus faecalis (ATCC 29212), Escherichia coli (ATCC 25922) and Proteus vulgaris (ATCC 33420). The dye catalytic properties of C. pentandra/Ag-NPs revealed the dye reduction time in which it was completed within 4 min for 20 mg/L rhodamine B and 20 min for 20 mg/L methylene blue dye, respectively. Based on the results, it is evident that C. pentandra/Ag-NPs are potentially promising to be applied in wound healing, textile, wastewater treatment, food packaging, labeling and biomedical fields. © 2020 by the authors. Licensee MDPI, Basel, Switzerland.

SciVal Topic Prominence

Topic: Silver Nanoparticles | Acid Gold Tetrachloride | Biofabrication

Prominence percentile: 99.959

Chemistry database information

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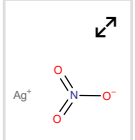
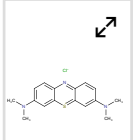
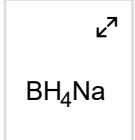

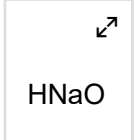

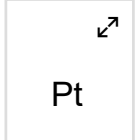

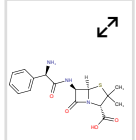

Author keywords

Antibacterial assay | Catalytic dye reduction | Ceiba pentandra | Entada spiralis | Silver nanoparticles

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