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Supplementary Materials

Unveiling The Multi Functionality of $CeCuIn_2O_5$ Nanoparticles: A Promising Approach For UV-Light Photocatalysis, Electrochemical Sensing and Antibacterial Applications

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1. MATERIALS METHOD

1.1. Antibacterial activity

1.1.1. Preparation of bacterial culture

The single pure colony was recovered from glycerol vial of frozen glass beads. The glass bead was incubated for 24 hours at 37° C in brain heart infusion broth. A cell density of 1x106 CFU/mL was determined using UV-vis spectroscopy at 600 nm [23].

1.1.2. Minimum inhibitory concentration by resazurin assay

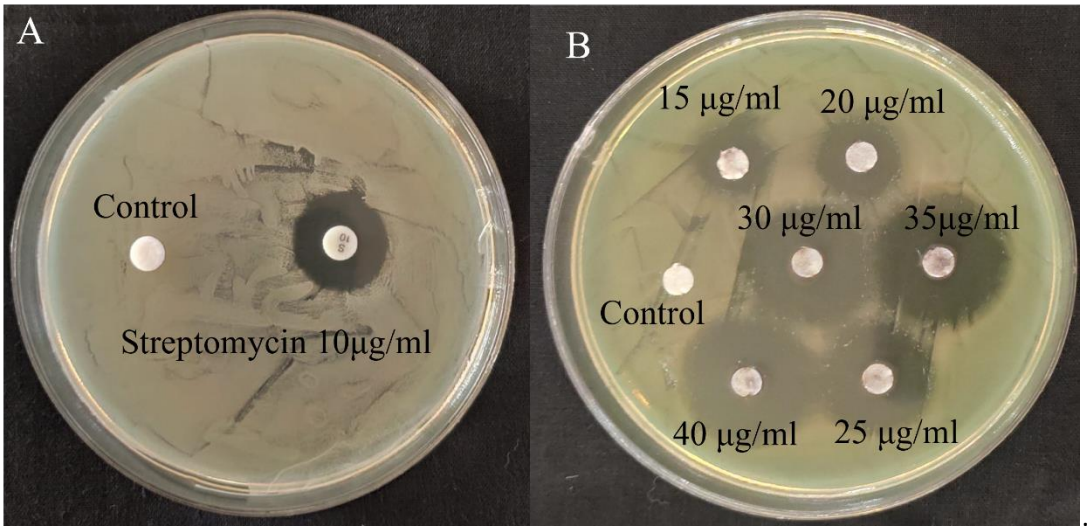
Streptomycin, a wide-spectrum antibiotic, was frequently employed as a bactericidal agent. A mixture of every component except the tested item was employed as a positive control. Any fluids that did not enable bacterial growth were included in the negative controls. The plates were incubated at 37° C for 24 hours after being wrapped in thin plastic sheets [24].

1.1.3. Disc diffusion method

This method was used to study the synthesised chemical's dose dependent antibacterial activity (CAI NPs) further overnight preparation of bacterial culture, 1x107 CFU/mL cells were placed in nutritional agar, followed by a sterile disc (6 mm) with different concentrations of synthetic derivatives. Sterile saline water served as the negative control, while streptomycin (10g/disc) served as the positive control. In order to analyse the zone of inhibition (ZOI), the plates were inverted and incubated at 37° C for 24 hours [25].

1.1.4. Evaluation of MRSA cell damage by potassium efflux

The difference in potassium efflux was utilised to assess MRSA cell membrane damage using Wang's method [26]. The culture was pelletized and resuspended in a solution of 100 mM sodium phosphate (pH 7). At 600 nm, the MRSA cell density was adjusted to an OD of 0.7. MRSA cell culture was treated with a synthesised chemical (CAI NPs) at twice the MIC in a 100 mL beaker and magnetically spun at 37° C. The MRSA cell solution was extracted at regular intervals of 0, 30, 60, 90, 120, and 150 minutes, and the supernatant intensity was evaluated by ICP-OES (PerkinElmer, Optima-8000) at 766.5 nm. NIST standards with a range of 2 to 10 ppm were used to calibrate the device. Each experiment was carried out three times.



Supplementary Fig 1. Antimicrobial activity of Ce-Ag-In oxide nanoparticle against MRSA. (A) MRSA tested with standard drug Streptomycin 10µg/disc (16.60±0.04) ZOI in mm. (B) Ce-Ag-In oxide nanoparticle with different concentration

Supplementary Table 1. Malachite green degradation percentage at pH 7 with 5 mg of dye and 40 mg of CCI NPs

Malachite green dye (mg)	Quantity of CCI NPs added (mg)	Time (min)	Percentage of MG dye degradation at every 10 min interval
5	40	0	0
5	40	10	16.8
5	40	20	21.6
5	40	30	35.2
5	40	40	48.8
5	40	50	56.8
5	40	60	60.0
5	40	70	65.6
5	40	80	89.6