

Bio-Inspired Ce–TiO₂ Nanostructures as Triple-Functional Platforms for Environmental and Biomedical Applications

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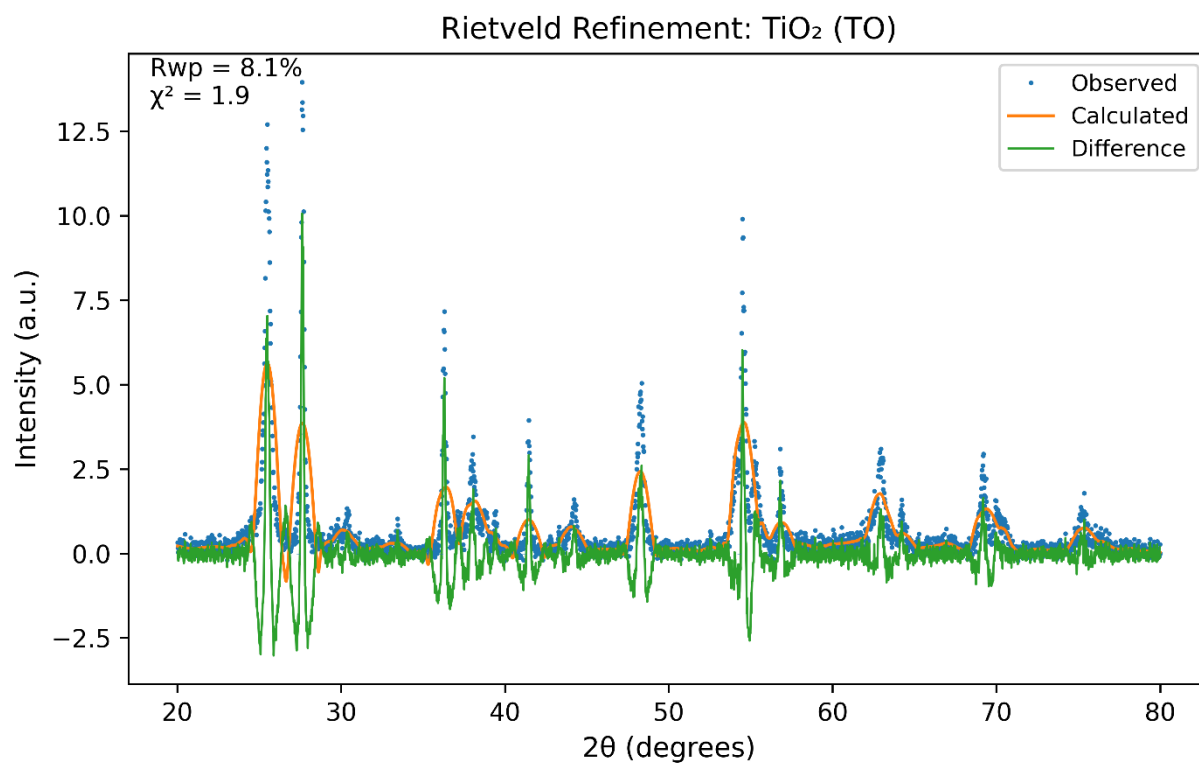
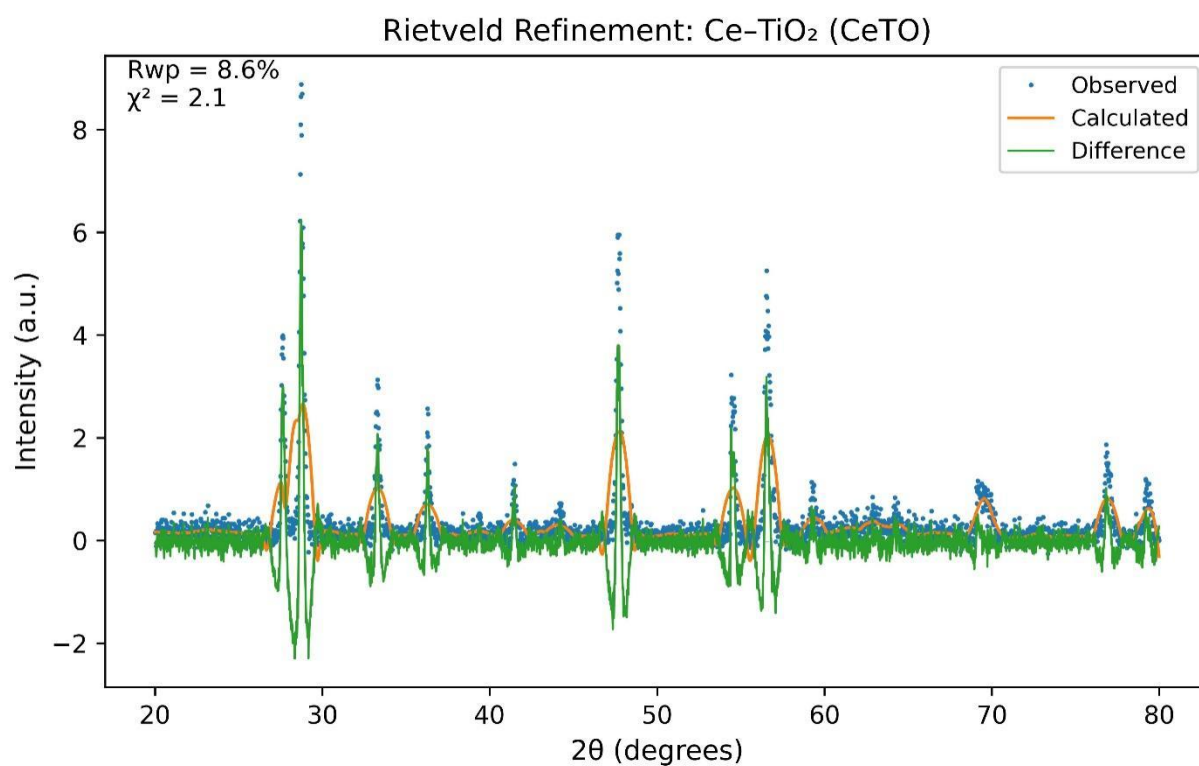


Figure S1-S2. Rietveld refinement profiles of (a) undoped TiO₂ (TO) and (b) Ce-doped TiO₂ (CeTO) in the 2θ range of 20–80°. Observed data (dots), calculated patterns (solid line), Bragg positions for anatase

and rutile phases (tick marks), and difference curves (offset) are shown. Refinement confirms biphasic TiO₂ structures, with CeTO exhibiting increased rutile contribution. The quality of fit is indicated by Rwp and χ^2 values.

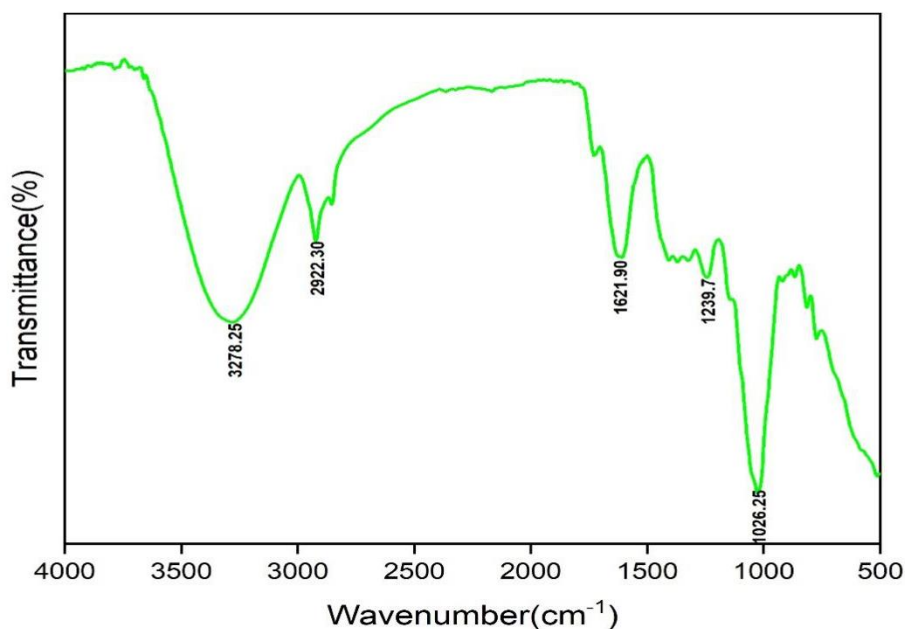


Figure S3. FTIR transmittance spectrum of the leaf extract used as a control (4000–500 cm⁻¹). Characteristic absorption band 3278 cm⁻¹ corresponding to O-H/N-H stretching and 2922 cm⁻¹ corresponds to aliphatic C-H stretching, 1621 cm⁻¹ typically corresponds to aromatic/amide vibrations, and C-O stretching are observed, and FTIR absorption band around 1026 cm⁻¹ corresponds to C-O stretching vibrations of alcohols, phenols, or polysaccharides consistent with phytochemical constituents commonly reported for plant extracts. This control spectrum supports assignment of surface functional groups in the synthesized TiO₂ and Ce-TiO₂ samples.

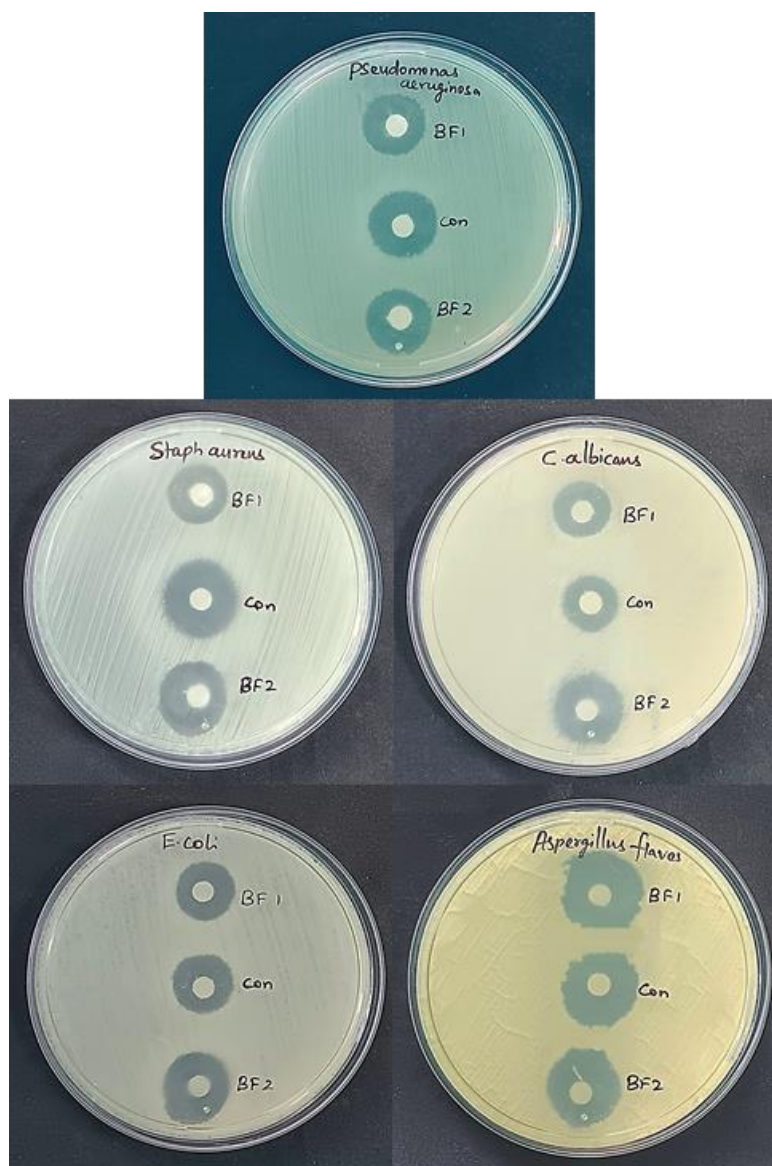


Figure S4.Antimicrobial activity of undoped TiO_2 (BF-1) and Ce-doped TiO_2 (BF-2) nanoparticles against bacterial (*E. coli*, *P. aeruginosa*, *S. aureus*) and fungal (*C. albicans*, *A. flavus*) strains via the Kirby–Bauer disk diffusion method.

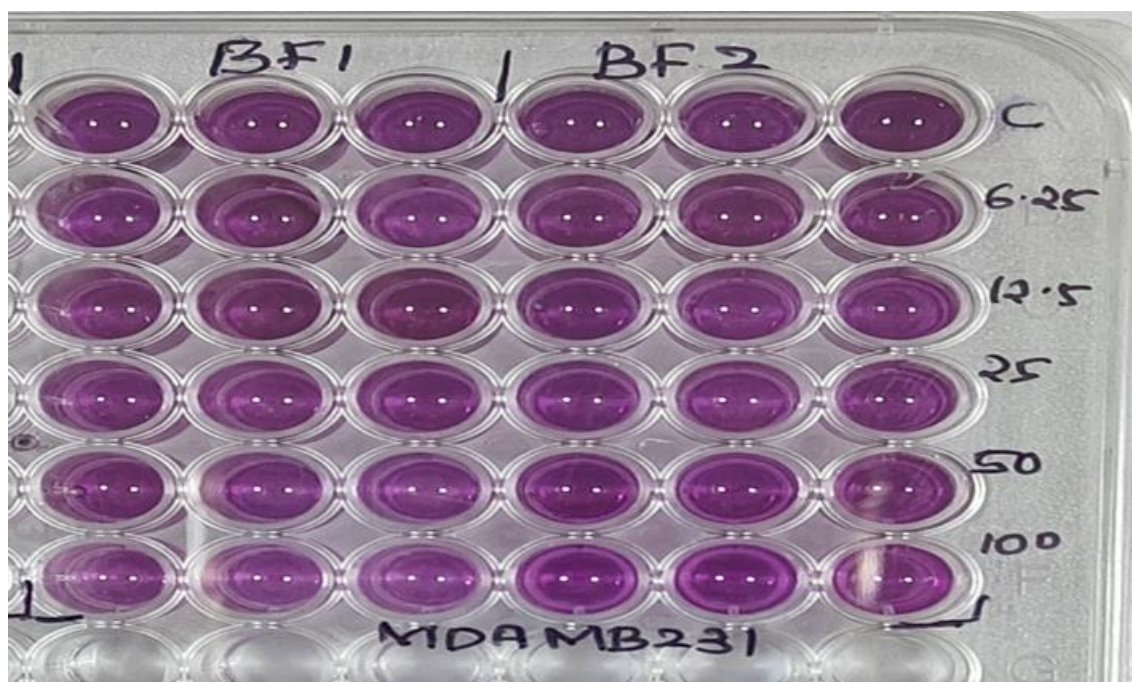


Figure. S5 MTT assay images showing formazan color intensity in MDA-MB-231 cells treated with varying concentrations of TO and CeTO NPs. The progressive decrease in purple coloration at higher concentrations reflects reduced mitochondrial activity and cell viability, highlighting the dose-dependent cytotoxic effect.