Integrated solar-photocatalytic and biological treatment of pharmaceutical wastewater

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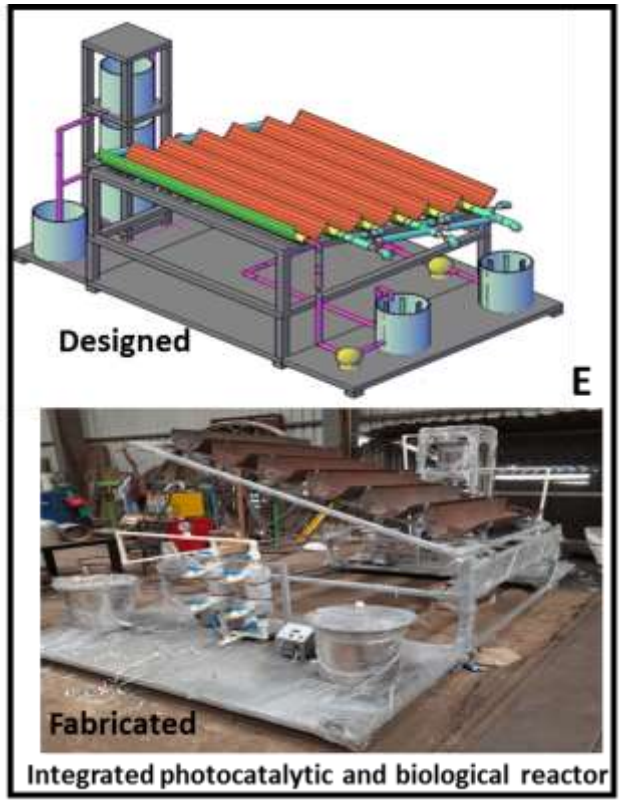
Objectives and Deliverables

A- Development of broad-spectrum metal-doped photocatalytic materials using extracellular plant-based doping system
B- Development of a zero-catalyst loss photocatalytic system
C- Integration of photocatalytic and biological systems and ex-situ remediation of PhACs wastewater

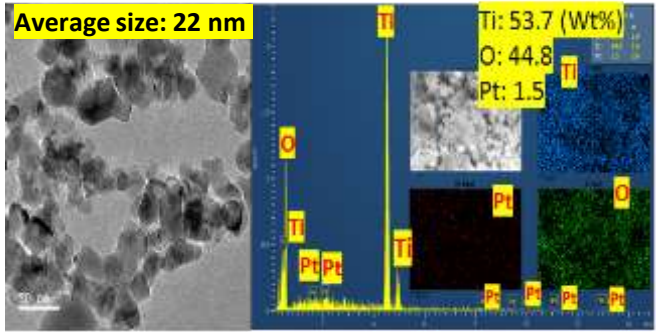
Key Highlights and Project Outcomes

- Metal doped TiO_2 and ZnO have been synthesized by using bio-mediated doping method
- Characterization results claimed successful doping of metal ions in semiconductor photocatalysts (Figs. A and B)
- Bandgap energies of TiO_2, Pt-TiO_2, Au-TiO_2, Cu-TiO_2, Ag-TiO_2, Ni-TiO_2, ZnO, Ag-ZnO, NiO-ZnO were found to be 3.29, 3.02, 2.55, 2.24, 2.53, 2.83, 3.37, 2.84 and 2.20 eV, respectively
- $Pt_{1.5}$-TiO_2 showed great degradation efficiency against ciprofloxacin (94%), norfloxacin (88%), diclofenac (71%), chloroquine (57%), and sulfamethoxazole (83%) under visible light within 2 hours (Fig. C)
- Antibiotic degrading bacterial strains (to used in purposed biological degradation system) are isolated which showed high degradation efficiency against various antibiotics and anti-inflammation molecules (Fig. D)
- Integrated pilot scale (25 L) photocatalytic and biological reactor has been designed and fabricated (Fig. E)

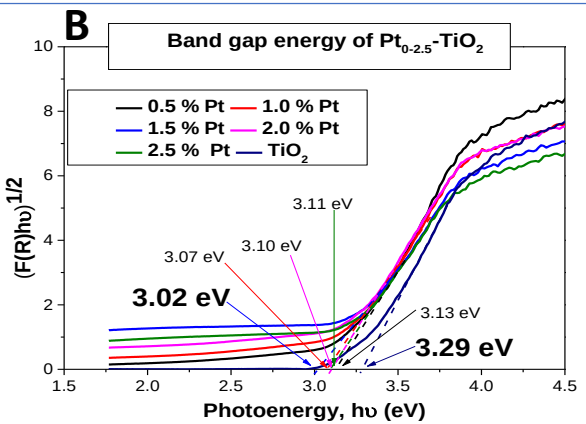


Integrated photocatalytic and biological reactor

A FETEM image and EDX data of $Pt_{1.5}$-TiO_2



B



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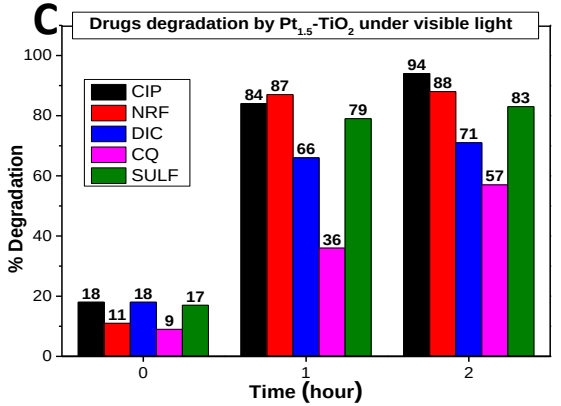

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