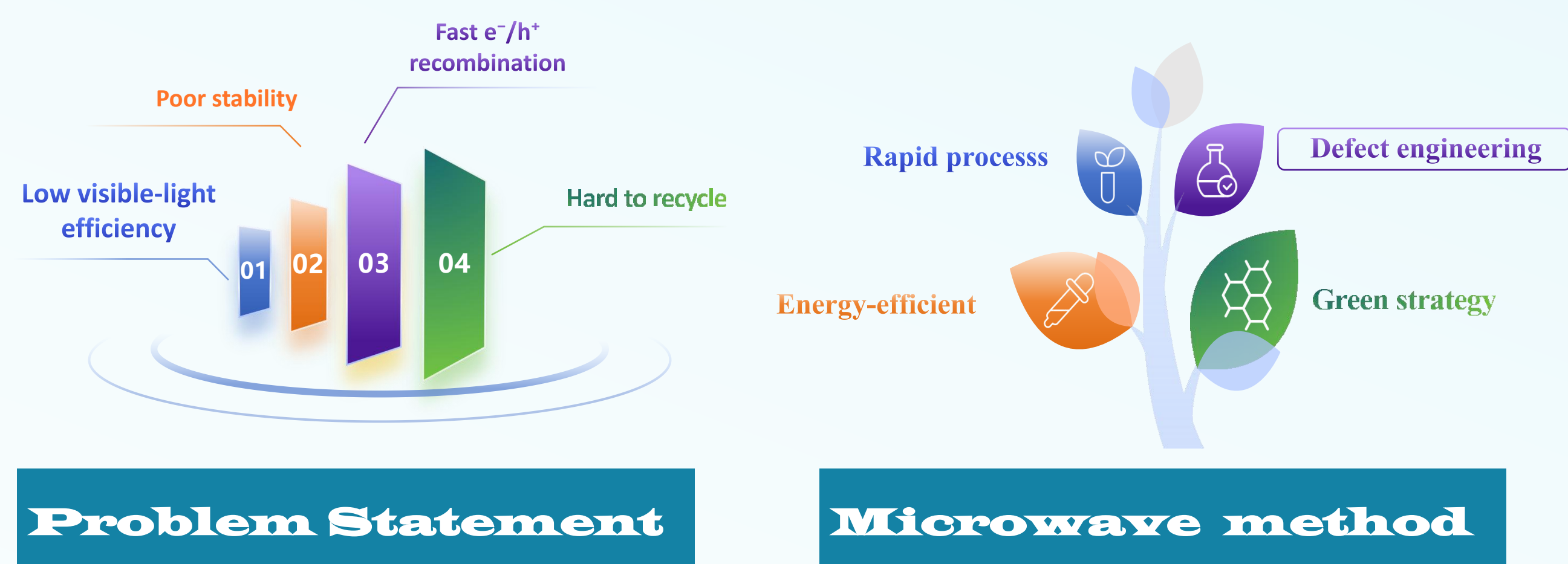


Highlights

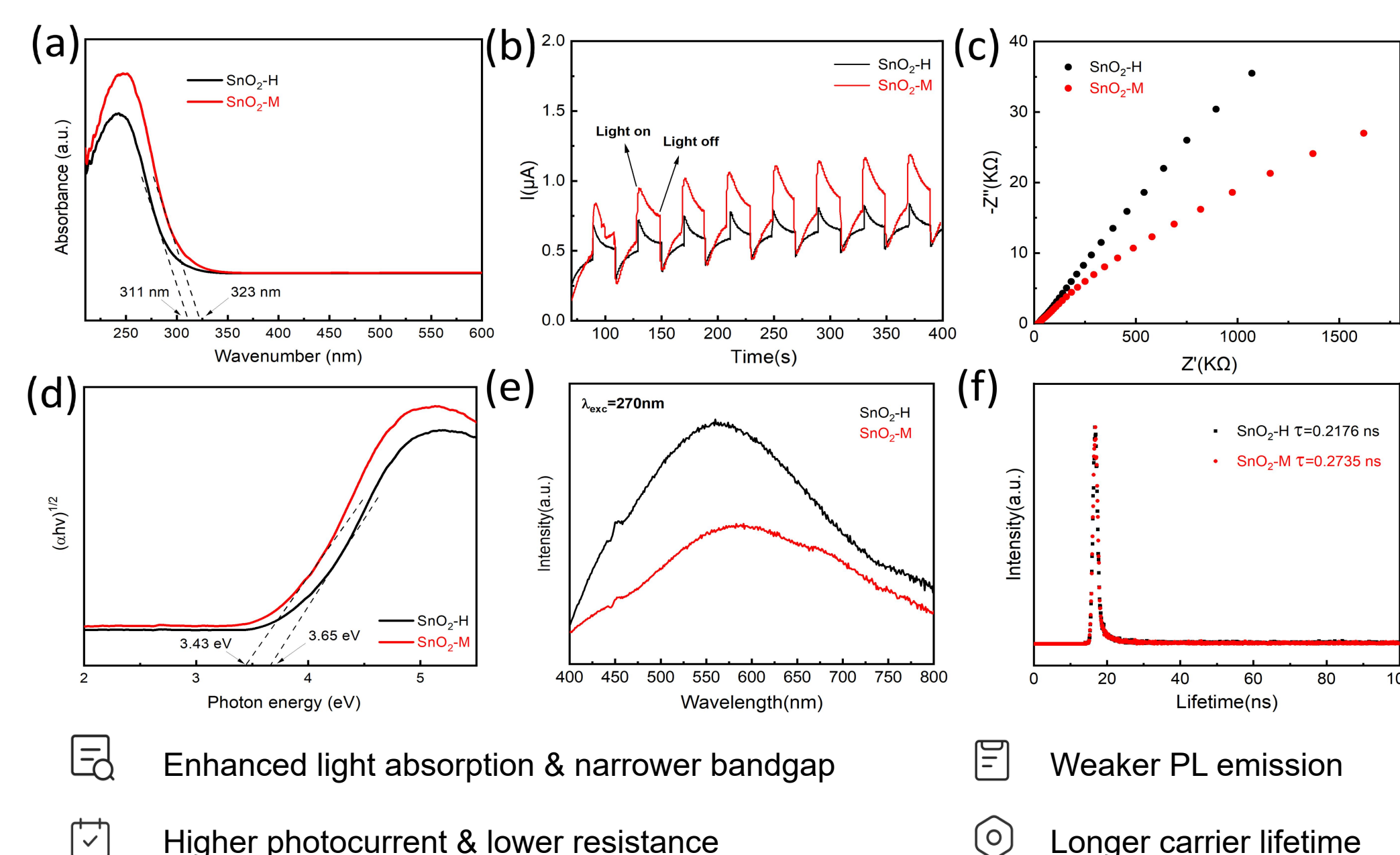
- Microwave synthesis enables rapid and green preparation of SnO₂.
- SnO₂-M shows smaller size and higher surface area than SnO₂-H.
- SnO₂-M achieves ~2.2× higher CIP degradation efficiency.
- Improved charge separation enhances photocatalytic activity.
- DFT confirms stronger adsorption and defect-driven activity.

Objectives

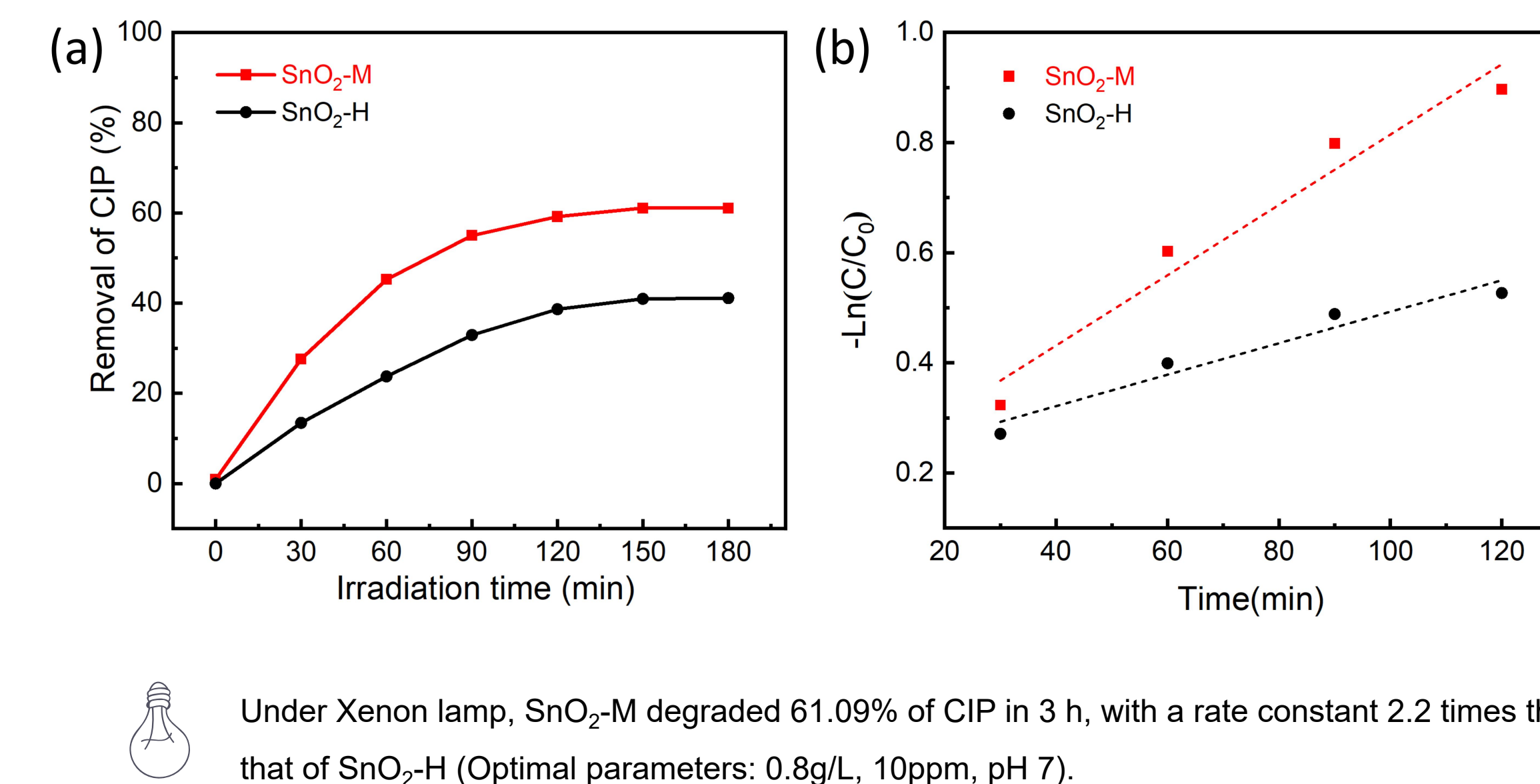
- To synthesise & characterise SnO₂ (microwave / hydrothermal); structure, morphology, surface & optical properties
- To evaluate & investigate photocatalytic performance for CIP degradation; ROS via scavenging & DFT insights



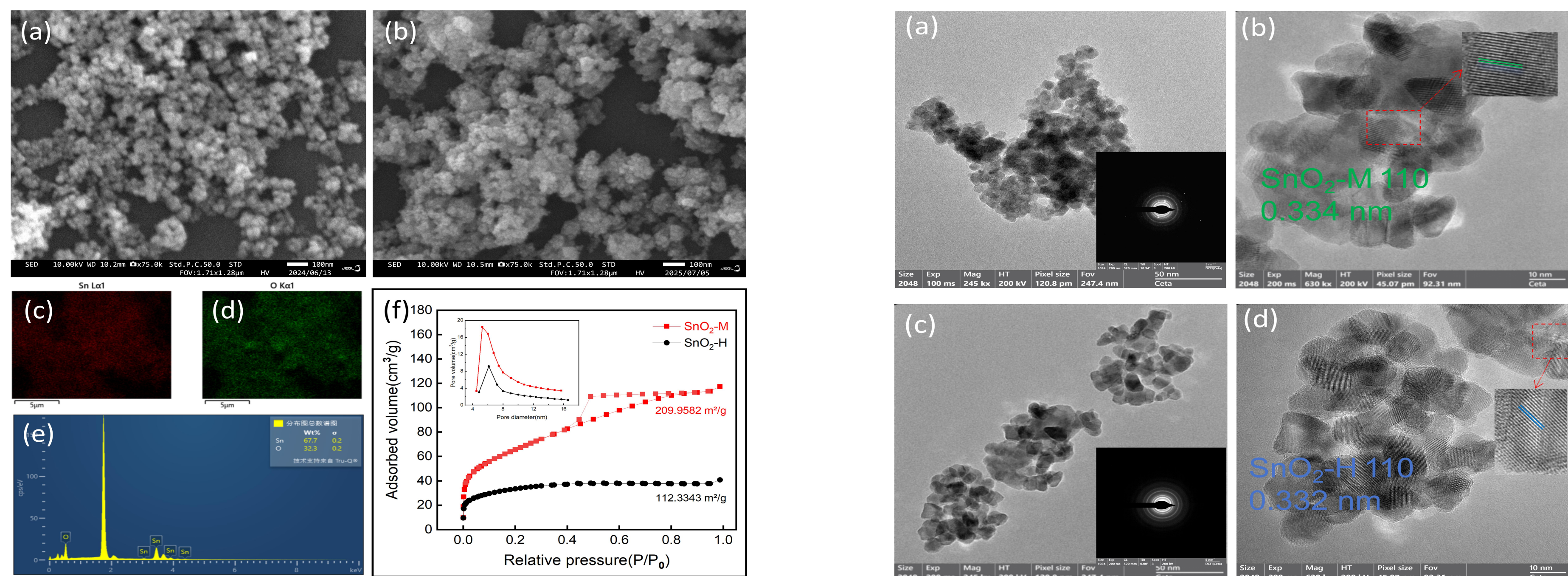
Optical and Charge Transfer Properties



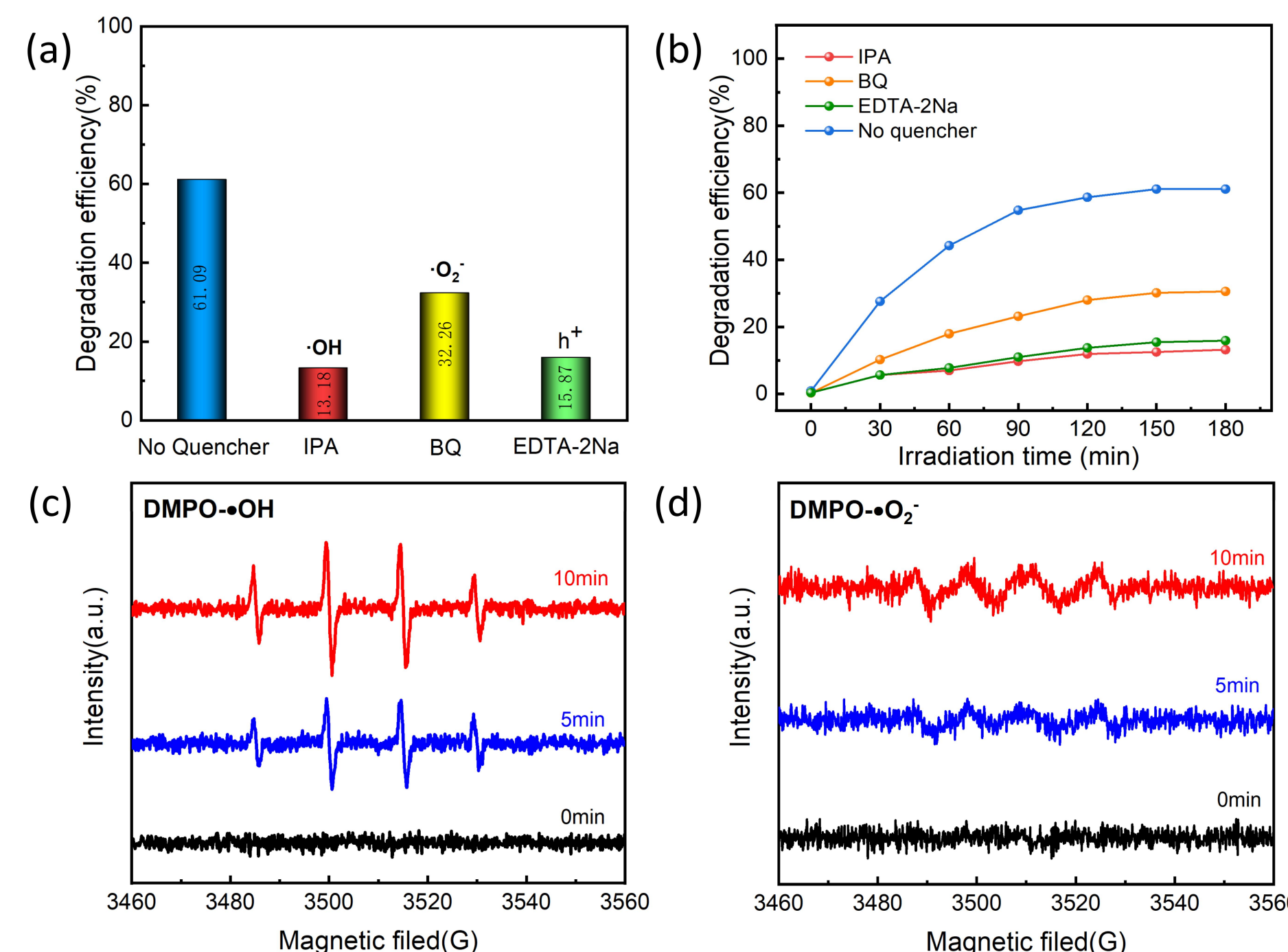
Photocatalytic Efficiency



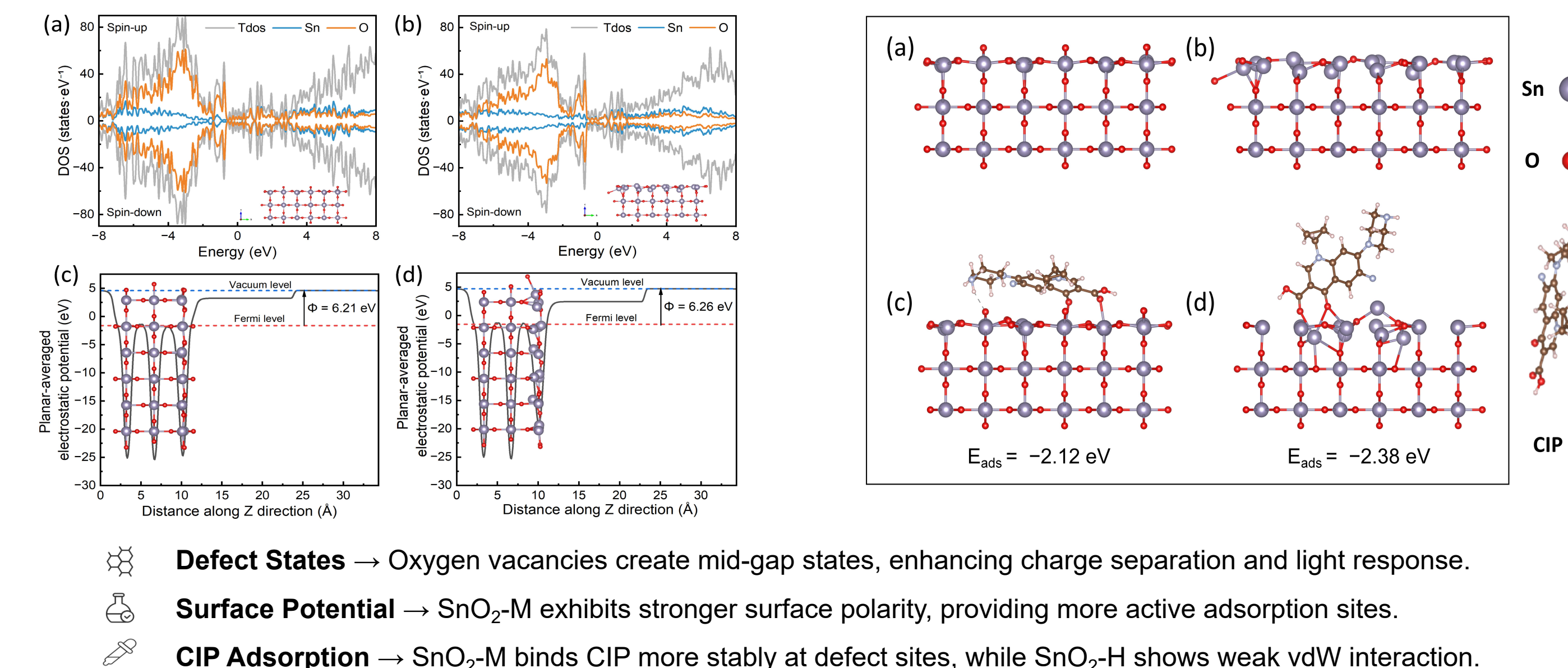
Structural Characterizations



Radical Scavenging Test



DFT Calculations



Conclusions

Microwave-synthesized SnO₂ (SnO₂-M) with smaller size, larger surface area, and abundant oxygen vacancies was confirmed by experiments and DFT to promote charge separation and CIP adsorption. Consequently, SnO₂-M achieved 2.2× higher degradation efficiency (61.09% in 3 h), with •OH and h⁺ as the dominant reactive species, highlighting microwave synthesis as a promising strategy for high-performance photocatalysts in environmental remediation.

- Uniform smaller nanoparticles (avg. size SnO₂-M ~10 nm)
- Porous structure with larger surface area (~210 m²/g)
- Clear lattice fringes
- Fewer and more diffuse diffraction rings