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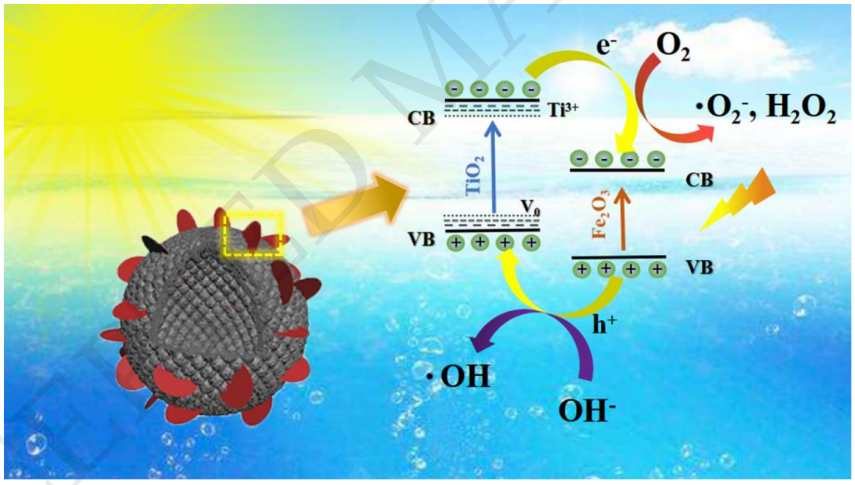
Graphic abstract



Defect-engineered γ-Fe_2O_3/mesoporous black TiO_2 hollow sphere heterojunctions are fabricated by metal-ion intervened hydrothermal technology and high-temperature hydrogenation reduction, which exhibit efficient charge separation and boosting solar-driven photocatalytic degradation performance of biotoxic tetracycline due to ultrathin γ-Fe_2O_3 nanosheets with narrow bandgap offering more surface active sites, the hollow structure and the defect engineering enhancing solar-light-harvesting and spatial separation of photogenerated charge carriers.