

From photocatalysis to photoreforming for sustainable energy and environment

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The oceans and human health are affected by multiple hazards from plastic pollution, while the Earth's atmosphere suffers from huge amounts of CO₂ emission from fossil fuels. Photocatalysis offers a sustainable pathway for energy and environmental applications, including water splitting for hydrogen production and CO₂ conversion into value-added fuels. In parallel, photoreforming, a similar process that requires no additional scavenger agents, presents a novel approach for converting plastic waste into valuable organic chemicals while simultaneously generating clean hydrogen [1-4].

This talk will introduce recent advancements in photocatalyst design, with a focus on high-entropy oxides [5], black oxides with oxygen vacancies [6], high-pressure phases [7], and sulfur-vacancy rich catalysts [8] for both photocatalysis and photoreforming processes. These materials exhibit unique defect structures, electronic configurations, and surface properties that enhance charge separation, light absorption, and catalytic efficiency. The discussion will highlight the mechanistic insights into these processes and their potential for sustainable energy production and waste management, paving the way for a cleaner and more sustainable future.

References:

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