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Biohydrogen production using hybrid photocatalytic - Fermentative systems

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Biohydrogen is a highly efficient, carbon-free energy carrier, yet limitations in biological conversion efficiency hinder widespread adoption. This study presents a hybrid biohydrogen production platform integrating photocatalytic water splitting with dark-fermentative pathways. Metal–organic framework (MOF) photocatalysts demonstrated exceptional light absorption and hydrogen evolution rates under simulated solar exposure. When combined with engineered Clostridium species optimized for hydrogenase activity, total hydrogen output increased by 76%. Substrate recycling between photocatalytic and microbial stages further enhanced efficiency. Lifecycle modeling suggests that hybrid systems could outperform traditional biohydrogen methods in both cost and energy return. This research establishes a viable model for industrial-scale hydrogen production from renewable resources.

Biography

Hannah Schultz is a distinguished professor of renewable energy systems at ETH Zurich. Her work spans photocatalysis, microbial bioenergy pathways, and hybrid renewable fuel systems. She has led major EU-funded clean hydrogen initiatives and has published more than 100 papers on advanced bioenergy technologies.

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