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REVIEW PAPER

Cutting-edge technological advancements in biomass-derived hydrogen production

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Abstract Production of hydrogen as carbon-free energy from renewable organic waste biomasses has been adopted for the long-term sustainability of a circular economy through various chemical and biological conversion processes. Conversion of waste biomasses to hydrogen provides dual benefits of low-cost energy-dense biofuel production and simultaneous waste reduction in eco-friendly valorization. Advancements in existing chemical and biological processes through light-induced photoreformation and microbial syntrophy-mediated metabolic induction in fermentation, respectively, facilitated holistic conversion of biowaste for maximum recovery of hydrogen by minimizing by-product generation. This review focuses on various thermochemical, photocatalytic reformation, and biological processes involving direct or indirect conversion of solid organic biomasses to hydrogen and their possible technological advancements to generate waste-to-value-added products. The techno-economic assessment describes the feasibility of waste biomass-derived hydrogen production over other technologies for industrial implementation.

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