**Efficient Conversion of Organic Waste into Sustainable Hydrogen Energy: A Green Approach**

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**Abstract**

Increased energy demand at the global level and environmental issues have resulted in enhanced exploration for sustainable, clean, and renewable sources of energy. One of the most promising alternatives to fossil fuels is hydrogen energy. It is because of various advantages such as high efficiency, high energy density, cleanliness, and zero carbon emissions. The efficient conversion of organic waste into hydrogen energy is the need of the hour as it serves a dual purpose. It converts the waste into a useful energy source thereby following the principles of waste management as well as clean energy production. The chapter deals with various types of organic waste that are utilized for the production of hydrogen energy. The chapter further explores various technologies like biological as well as thermochemical methods for hydrogen energy production. The book chapter provides in-depth knowledge of key processes involved in hydrogen production such as anaerobic fermentation, photo fermentation, pyrolysis, gasification, and hydrothermal processing. Furthermore, several economic and environmental benefits, challenges, and opportunities related to the conversion of organic waste to hydrogen energy have been highlighted thereby focussing on the concept of sustainable energy production and circular bioeconomy.

***Keywords:*** Organic waste; Hydrogen energy; Biological process; Thermochemical process; Sustainable energy production