

"Hydrogen production from biomass and wastes"

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Abstract

Environmental pollution, as well as the greenhouse effect caused by the use of conventional fuels, makes necessary identifying clean and efficient alternative energy sources. Hydrogen (H₂) has been widely recognized as an alternative to fossil fuels and a source for chemical and fuel synthesis, due to its high energy content (142 MJ/kg) and zero carbon emissions when combusted. Among various production processes, biological H₂ production methods are less energy intensive and occurs at ambient temperatures and pressures. Methods for its production include biophotolysis of water, photofermentation, dark fermentation (DF) and Microbial Electrolysis Cells (MECs). The present study aims to summarize the microbiological and technological background of the DF process, emphasizing on the exploitation of biomass and wastes as potential feedstocks. The basic principles, the microbiology and the current technology of the process are outlined, while application of DF in biomass/wastes of different origin, in lab and pilot scale experiments, are discussed. Finally, the basic principles of MEC technology for H₂ generation is presented, as a possible method for further utilization of the generated by-products from DF, developing thus a two-stage H₂ process.