



Developments in Hydrogen Production through Microbial Processes; Pakistan's Prospective

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Abstract

Currently, hydrogen (H₂) is primarily used in the chemical industry as a reactant, but it is being proposed as future fuel. H₂ has great potential as an environmentally clean energy fuel and as a way to reduce reliance on imported energy sources. A combination of the need to cut carbon dioxide emissions, the prospect of increasingly expensive oil and the estimated growth in the world's vehicle fleet indicates that only H₂ can plug the gap. There are many processes for H₂ production. The key issue to make H₂ an attractive alternative fuel is to optimize its production from renewable raw materials instead of the more common energy intensive processes such as natural gas reforming or electrolysis of water. With such vision, this paper reviews developments in microbial processes for H₂ production followed by a road map to H₂ economy in Pakistan. The H₂ economy potentially offers the possibility to deliver a range of benefits for the country; however, significant challenges exist and these are unlikely to be overcome without serious efforts.

Keywords: At least five

1. Introduction

At the start of the 21st century, we face significant energy challenges. The concept of sustainable development is evolved for a livable future where human needs are met while keeping the balance with nature. Driving the global energy system into a sustainable path is progressively becoming a major concern and policy objective.

At the present, world's energy requirement is by large being fulfilled by fossil fuels which serve as a primary energy source. Fossil fuel has delivered energy and convenience, in our homes, for transport and industry. However, the overwhelming scientific evidence is that the unfettered use of fossil fuels is causing the world's climate to change, with potential disastrous effect on our planet. The dramatic increase in the price of petroleum are also forcing for the search for new energy sources and alternative ways. World is in search of convenient, clean, safe, efficient and versatile energy source as well as energy carrier that can be delivered to the end user. Electricity is one of the energy carriers which is already

being used worldwide. Electricity is a convenient form of energy, which can be produced from various sources and transported over large distances. Hydrogen is another clean energy source as well as energy carrier. H₂ economy has often been proposed by researchers as another clean, efficient and versatile renewable energy sources as well as energy carrier [1-3], but the transformation from the present fossil fuel economy to a H₂ economy will need the solution of numerous complex scientific and technological issues. The provision of cost competitive hydrogen in sufficient quantity and quality is the groundwork of a hydrogen energy economy. Presently H₂ is not an alternative fuel but only an energy carrier produced from H₂-rich compounds. H₂ holds the promise as a dream fuel of the future with many social, economic and environmental benefits to its credit. It has the long-term potential to reduce the dependence on foreign oil and lower the carbon and criteria emissions from the transportation sector as depicted in Table 1.