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Integration of Renewable-Energy-Based Green Hydrogen into the Energy Future

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Abstract

There is a growing interest in green hydrogen, with researchers, institutions, and countries focusing on its development, efficiency improvement, and cost reduction. This paper explores the concept of green hydrogen and its production process using renewable energy sources in several leading countries, including Australia, the European Union, India, Canada, China, Russia, the United States, South Korea, South Africa, Japan, and other nations in North Africa. These regions possess significant potential for green hydrogen production, supporting the transition from fossil fuels to clean energy and promoting environmental sustainability through the electrolysis process, a common method of production. The paper also examines the benefits of green hydrogen as a future alternative to fossil fuels, highlighting its superior environmental properties with zero net greenhouse gas emissions. Moreover, it explores the potential advantages of green hydrogen utilization across various industrial, commercial, and transportation sectors. The research suggests that green hydrogen can be the fuel of the future when applied correctly in suitable applications, with improvements in production and storage techniques, as well as enhanced efficiency across multiple domains. Optimization strategies can be employed to maximize efficiency, minimize costs, and reduce environmental impact in the design and operation of green hydrogen production systems. International cooperation and collaborative efforts are crucial for the development of this technology and the realization of its full benefits.

Keywords: green hydrogen, renewable energy, electrolysis, hydrogen production, hydrogen storage, fossil fuel s

Full text

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