Sustainable Development via Hydrogen Energy

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Abstract

The energy carrier hydrogen is a key facilitator of sustainable energy, via hydrogen energy systems and can contribute significantly to enhancing global sustainability. As easily accessible fossil fuel supplies become increasingly scarce and environmental concerns escalate in impact and expand, hydrogen energy is likely to become an increasingly important. With the world's energy sources becoming less fossil fuel-based, hydrogen and electricity are expected to be the two dominant energy carriers for the provision of end-use services, in a hydrogen economy. A hydrogen economy involves many types of hydrogen energy systems, which together allow greater use of renewable energy resources.

Numerous commercial and pre-commercial processes exist for producing hydrogen from all kinds of fossil fuels as well as from non-fossil fuel sources like solar energy, wind energy, bioenergy energy and various other types of renewable in addition to nuclear energy. Technologies for the storage, transport and distribution of hydrogen also exist and are undergoing development. Technologies are in use and undergoing development for utilizing hydrogen as an energy carrier, especially in transportation and by energy utilities. The technologies needed for hydrogen energy systems are undergoing much research and development, and advances are constantly being made.

Routes to hydrogen production are possible from various energy sources. Both renewable and non-renewable energy sources are utilizable for hydrogen production. Renewable energy options are usually considered more sustainable.

In this presentation, the role of hydrogen as an energy carrier and facilitator of sustainable energy is described and illustrated, and hydrogen energy systems that can contribute to a sustainable world are reviewed and discussed.

Recent Publications

1. Rosen, M.A., Koohi-Fayegh, S. 2017. Geothermal Energy: Sustainable Heating and Cooling Using the Ground. Wiley.
2. Aghbashlo, M. and Rosen, M.A. 2018. Exergoeconoenvironmental Analysis as a New Concept for Developing Thermodynamically, Economically, and Environmentally Sound Energy Conversion Systems. Journal of Cleaner Production 187:190-204.
3. Dincer, I., Rosen, M. A. and Ahmadi, P. 2017. Optimization of Energy Systems. Wiley, London.
4. Rosen, M.A., Koohi-Fayegh, S. 2016. Cogeneration and District Energy Systems: Modelling, Analysis and Optimization. Institution of Engineering and Technology, London.
5. Lescisin, M., Jianu, O.A., Pope, K. and Rosen, M.A. 2020. Investigating Azeotropic Separation of Hydrochloric Acid for Optimizing the Copper-Chlorine Thermochemical Cycle. International Journal of Hydrogen Energy 45(49):26080-26089.
6. Rosen, M.A., Koohi-Fayegh, S. 2016. Cogeneration and District Energy Systems: Modelling, Analysis and Optimization. Institution of Engineering and Technology, London.



Biography

Marc A. Rosen is a Professor at the University of Ontario Institute of Technology in Oshawa, Canada, where he served as founding Dean of the Faculty of Engineering and Applied Science. Dr. Rosen was President of the Engineering Institute of Canada. He is a registered Professional Engineer in Ontario, and serves as Editor-in-Chief of several journals and Director of Oshawa Power and Utilities Corporation. With over 60 research grants and contracts and 600 publications, Dr. Rosen is an active teacher and researcher in sustainable energy, environmental impact, and energy technology (including renewable energy and efficiency improvement). Much of his research has been carried out for industry, and he has written numerous books. Dr. Rosen has worked for such organizations as Imatra Power Company in Finland, Argonne National Laboratory near Chicago, and the Institute for Hydrogen Systems near Toronto. Dr. Rosen has received numerous awards and honors.

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