

IJARSCT

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

### Volume 2, Issue 1, December 2022

# **Review on Recent Trends in Hydrogen Fuel Cell**

Manoj Bauskar<sup>1</sup>, Adinath Aher<sup>2</sup>, Abhijit Dahagaonkar<sup>3</sup>

Assistant Professor, Department of Mechanical Engineering<sup>1</sup> Students, Department of Mechanical Engineering<sup>2,3</sup> All India Shri Shivaji Memorial Society's College of Engineering, Pune, Maharashtra, India

Abstract: This research review major goal is to show how the growing need for industrial decarbonization and sustainable energy efficiency is driving academics from various fields to look for new, more efficient ways to achieve these objectives. A hydrogen economy built on fuel cell and hydrogen technology is a realistic and viable solution to meet India's energy goals and raise social standards while ensuring independence and security of the country's energy supply. Rapid adoption of environmentally friendly technologies necessitates comprehensive policy changes and cooperative efforts from all Member States. This article provides an overview of fuel cell and hydrogen technology. This examination covers the principles and technical components of several fuel cell systems. The study examines all fuel cells in-depth, looking at the many types of fuel cells and how they function. Numerous industries, including the automotive industry and stationary power generation, can benefit from the use of fuel cells. To compare the various fuel cell types, the most effective and environmentally friendly fuel cell is investigated..

Keywords: FCV, Molten Carbonate, alkaline

### REFERENCES

- [1]. Saikia, Kaustav; Kakati, Biraj Kumar; Boro, Bibha; Verma, Anil (2018). "Current Advances and Applications of Fuel Cell Technologies". Recent Advancements in Biofuels and Bioenergy Utilization. Singapore: Springer. Pp. 303–337.
- [2]. Khurmi, R. S. (2014). Material Science. S. Chand & Company.
- [3]. Schmidt-Rohr, K. (2018). "How Batteries Store and Release Energy: Explaining Basic Electrochemistry", J. Chem. Educ., 95: 1801–1810.
- [4]. Ajanovic A., Haas R. Economic Prospects and Policy Framework for Hydrogen as Fuel in The Transport Sector. Energy Policy. 2018; 123:280–288. Doi: 10.1016/J.Enpol.2018.08.063
- [5]. Hames Y., Kaya K., Baltacioğlu E., Turksoy A. Analysis of the control strategies for fuel saving in the hydrogen fuel cell vehicles. Int. J. Hydrog. Energy. 2018; 43:10810–10821. doi: 10.1016/j.ijhydene.2017.12.150
- [6]. Salleh M.T., Jaafar J., Mohamed M.A., Norddin M., Ismail A.F., Othman M., Rahman M.A., Yusof N., Aziz F.,
- [7]. Salleh W.N.W. Stability of SPEEK/Cloisite®/TAP nanocomposite membrane under Fenton reagent condition fordirect methanol fuel cell application. Polym. Degrad. Stab. 2017;137:83–99.doi: 10.1016/j.polymdegradstab.2016.12.011
- [8]. B. Parkinson, P. Balcombe, J.F. Speirs, A.D. Hawkes, K. Hellgardt, Levelized cost of CO2 mitigation from hydrogen production routes, Energy Environ. Sci. 12 (1) (2019) 19–40.
- [9]. https://en.wikipedia.org/wiki/Fuel\_cell#cite\_note-1
- [10]. "Types of Fuel Cells". Department of Energy EERE website
- [11]. Energy Glossary, California Energy Commission
- [12]. Efficiency, J.M.K.C. Donev et al. (2020). Energy Education Efficiency
- [13]. C. Dillon. (2009, October). How Far Will Energy Go? An Energy Density Comparison [Online].
- [14]. Uni. South Carolina. (2003, October). Description of Energy and Power [Online]

Copyright to IJARSCT www.ijarsct.co.in

DOI: 10.48175/568



## IJARSCT

### International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

#### Volume 2, Issue 1, December 2022

- [15]. Jelley, N. A. (Nicholas Alfred), 1946-. A dictionary of energy science. [Oxford]
- [16]. Umit B. Demirci (2007). "Review: Direct liquid-feed fuel cells: Thermodynamic and environmental concerns". Journal of Power Sources. 169.
- [17]. Ibrahim Dincer, Calin Zamfirescu (2014). "4.4.7 Direct Methanol Fuel Cells". Advanced Power Generation Systems
- [18]. Keith Scott, Lei Xing (2012). "3.1 Introduction". Fuel Cell Engineering. p. 147.
- [19]. Zhong, J. et al. Synthesis and high electrocatalytic activity of Au-decorated Pd heterogeneous nanocube catalysts for ethanol electro-oxidation in alkaline media. Catal. Sci. Technol. 6, 5397–5404 (2016).
- [20]. Adamson, K.A. Stationary Fuel Cells; Elsevier: Amsterdam, The Netherlands, 2007
- [21]. Office of Renewable Energy. Types of Fuel Cells|Department of Energy; U.S. Office of Energy Efficiency and Renewable Energy: Washington, DC, USA, 2017.
- [22]. Kirubakaran, A.; Jain, S.; Nema, R.K. A review on fuel cell technologies and power electronic interface. Renew.Sustain. Energy Rev. 2009, 13, 2430–2440.
- [23]. US DOE (Energy Efficiency & Renewable). Comparison of Fuel Cell TechnologiesAvailableonline:https://www1.eere.energy.gov/hydrogenandfuelcells/fuelcells/pdfs/fc\_compari son\_chart.pdf, Accessed on 27August 2021.
- [24]. Sabihuddin, S.; Kiprakis, A.E.; Mueller, M. A numerical and graphical review of energy storage technologies. Energies 2015, 8, 172–216.
- [25]. Asghari, M.; Brouwer, J. Integration of a solid oxide fuel cell with an organic rankine cycle and absorption chiller for dynamic generation of power and cooling for a residential application. Fuel Cells 2019, 19, 361– 373
- [26]. Sammes, N.; Smirnova, A.; Vasylyev, O. Fuel Cell Technologies: State and Perspectives; Springer: Dordrecht, The Netherlands, 2005.
- [27]. Sabihuddin, S.; Kiprakis, A.E.; Mueller, M. A numerical and graphical review of energy storage technologies. Energies 2015, 8, 172–216.
- [28]. Chen, Y.; Nie, X.; Wang, B.; Xia, C.; Dong, W.; Wang, X.; Wang, B.Z. Tuning La0.6Sr0.4Co0.2Fe0.8O3 -δ perovskite cathode as functional electrolytes for advanced low-temperature SOFCs. Catal.
- [29]. Mahato, N.; Banerjee, A.; Gupta, A.; Omar, S.; Balani, K. Progress in material selection for solid oxide fuel cell technology: A review. Prog. Mater. Sci. 2015, 72, 141–337.
- [30]. Sebastian Altmann, Till Kaz, Kaspar Andreas Friedrich, Bifunctional electrodes for unitised regenerative fuel cells, Electrochimica Acta 56 (2011) 4287–4293
- [31]. F. Barbir, T. Molter, L. Dalton, Int. J. Hydrogen Energy 30 (2005) 351.
- [32]. Garche, J.; Jörissen, L. Applications of Fuel Cell Technology: Status and Perspectives. Electrochem. Soc. Interface 2015, 24, 39–43. [CrossRef]
- [33]. Yamarone, R. The Trader's Guide to Key Economic Indicators; Bloomberg Press: Hoboken, NJ, USA, 2004;ISBN 1576601390.
- [34]. Giorgi, L. Fuel cells: Technologies and applications. Open Fuel Cells J. 2013, 6
- [35]. Fuel Cells Archived November 23, 2010, at the Wayback Machine
- [36]. http://energy.gov/eere/fuelcells/types-fuel-cells#phosphoric, Accessed on 28 August 2021.
- [37]. Bagotsky, V.S. Fuel Cells: Problems and Solutions; John Wiley & Sons: Hoboken, NJ, USA, 2008.
- [38]. Li, X. Fuel cells. In Energy Conversion, 2nd ed.; CRR Press: Boca Raton, FL, USA, 2017.