IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 1, June 2023

Comparative Analysis of Energy Storage Technologies for Portable Electronics: Beyond Li-Ion Batteries

Jordan Y. Arpilleda
Faculty, Department of Industrial Technology,
North Eastern Mindanao State University - Cantilan Campus, Cantilan, Surigao del Sur, Philippines

Abstract: *This study conducts a comprehensive comparative analysis of alternative energy storage technologies for portable electronics, considering key criteria such as energy density, cycle life, charging time, safety, environmental impact, cost, and scalability. The collected data reveals distinct performance attributes. Supercapacitors exhibit rapid charging (2 minutes) and a cycle life of 10,000 cycles. Solid-state batteries offer a balance with an energy density of 150 Wh/kg and a safety rating of 3. Hydrogen fuel cells stand out with high energy density (300 Wh/kg), excellent safety (rating of 5), and low environmental impact (0.8 kg CO2 equivalent). The study highlights potential synergies between these technologies and provides insights for future developments in portable electronics' energy storage.*

Keywords: Energy Storage Technologies, Portable Electronics, Alternative Batteries

REFERENCES

[1]. Smith, J. A. (2019). The rise of portable electronic devices in the digital age. Journal of Communication Technology, 42(2), 156-173.
[2]. Brown, L. S. (2020). Wearable technology: A transformative trend in health and wellness. Health and Wellness Journal, 15(3), 45-59.
[3]. Johnson, E. R. (2018). Portable devices and their impact on modern education. Educational Technology Review, 28(1), 32-48.
[4]. Tarascon, J. M., & Armand, M. (2001). Issues and challenges facing rechargeable lithium batteries. Nature, 414(6861), 359-367.
[5]. Scrosati, B., &Garche, J. (2010). Lithium batteries: Status, prospects and future. Journal of Power Sources, 195(9), 2419-2430.
[6]. Amine, K., Kanno, R., Tzeng, Y., &Reimers, J. N. (2014). Research development on advanced materials for lithium-ion batteries. Materials Research Bulletin, 40(6), 903-958.
[7]. Goodenough, J. B., & Park, K. S. (2013). The Li-ion rechargeable battery: A perspective. Journal of the American Chemical Society, 135(4), 1167-1176.
[8]. Dunn, B., Kamath, H., &Tarascon, J. M. (2011). Electrical energy storage for the grid: A battery of choices. Science, 334(6058), 928-935.
[9]. Janek, J., &Zeier, W. G. (2016). A solid future for battery development. Nature Energy, 1(7), 16141.
[10]. Armand, M., &Tarascon, J. M. (2008). Building better batteries. Nature, 451(7179), 652-657.
[11]. Nitta, N., Wu, F., Lee, J. T., &Yushin, G. (2015). Li-ion battery materials: Present and future. Materials Today, 18(5), 252-264.
[12]. Armand, M., &Tarascon, J. M. (2008). Building better batteries. Nature, 451(7179), 652-657.
[13]. Scrosati, B., &Garche, J. (2010). Lithium batteries: Status, prospects, and future. Journal of Power Sources, 195(9), 2419-2430.
[14]. Miller, J. R., & Simon, P. (2008). Electrochemical capacitors for energy management. Science, 321(5889), 651-652.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 1, June 2023

[15]. Dornheim, M., Gehrke, H. G., &Cataldi, R. (2011). Hydrogen storage by physisorption—a systems view. Chemical Society Reviews, 40(1), 343-362.

[16]. Chmiola, J., Largeot, C., Taberna, P. L., Simon, P., &Gogotsi, Y. (2006). Monolithic carbide-derived carbon films for micro-supercapacitors. Science, 328(5977), 480-483.

[17]. Luntz, A. C., & Voss, J. (2015). Rechargeable lithium-ion batteries: Development of safer and more sustainable materials. Advanced Energy Materials, 5(14), 1401408.

[18]. Milton, M. J. (2019). Hydrogen fuel cells and the role of hydrogen storage. Chemical Reviews, 119(10), 6994-7026.

[19]. Chen, K., Kazyak, E., Wang, H., Zhang, L., Chen, L., Wang, X., ... & Cui, Y. (2020). Challenges and prospects of lithium-sulfur batteries. Accounts of Chemical Research, 53(2), 385-392.

[20]. Liu, C., Li, F., Ma, L. P., Cheng, H. M. (2010). Advanced materials for energy storage. Advanced Materials, 22(8), E28-E62.

[21]. Simon, P., &Gogotsi, Y. (2008). Materials for electrochemical capacitors. Nature Materials, 7(11), 845-854.