ABSTRACT

Driven by the need for efficient renewable energy solutions in Indonesia, this research focuses on the design and analysis of an Aluminium-Zinc (Al-Zn) battery prototype. The primary objective is to develop an integrated system featuring a 20 Wp solar-powered electrolysis process for electrolyte generation and an Internet of Things (IoT)-based monitoring framework. This study comparatively analyzes the effectiveness of NaOH and KOH electrolytes, with the research scope limited to the prototype's performance under fluctuating sunlight conditions. The methodology involved a comparative study of the electrolytes' pH evolution, the assembly of a 12-cell battery stack, and discharge characterization tests under load to determine practical performance and capacity. For real-time data visualization, a monitoring system was implemented using an ESP32 microcontroller connected to the ThingSpeak IoT platform. The results confirm the superiority of the KOH electrolyte, which achieved a pH of 12.6. While the battery prototype exhibited a stable discharge voltage profile, a critical weakness was identified in its extremely low measured capacity of only 0.040 mAh. This performance limitation is concluded to be a direct result of the cell's high internal resistance. Furthermore, challenges regarding the chemical incompatibility of the housing material were identified as a key implementation weakness.

***Keywords**: aluminium-zinc battery, electrolysis, solar power, Internet of Things, monitoring system, renewable energy.*