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ANTI-CORROSIVE PROPERTIES OF VARIOUS ORGANIC AND INORGANIC INHIBITORS IN ELECTROLYTE FOR ZINC-AIR BATTERIES

Priya Garg [a], Sudhish Kumar Shukla [a*], Pradeep Kumar Varshney [b]

[a] *Department of Sciences, School of Sciences, Manav Rachna University, Faridabad-121004, Haryana, India*
[b] *Swami Rama Himalayan University, Dehradun-248016, Uttarakhand, India*
[*] *e-mail: sudhish.shukla@gmail.com*

Abstract. Zinc-air batteries offer a promising alternative for portable energy storage. However, the corrosion of zinc in alkaline electrolytes poses a significant challenge. This study explores efficacy of various organic and inorganic inhibitors, including citric acid, potassium iodide and sodium alginate as anti-corrosive additives in 7M KOH. A comparative analysis of experimental and theoretical constant-voltage discharge measurements and corrosion rates reveals that corrosion inhibition of zinc acetate and organic acid is more efficient in reducing dendrite formation. The active sites of organic acids, specifically oxygen atoms of carbonyl groups, adsorb onto the zinc surface, forming a composite protective film. This film effectively shields zinc from corrosion while allowing unimpeded battery reactions. Moreover, the addition of citric acid results in a maximum inhibition efficiency of 55.5%, which is higher than the efficiencies achieved with potassium iodide and sodium alginate additives. Surface analysis confirms that citric acid promotes the formation of a uniform protective film on the zinc surface. These findings indicate that the citric acid additive significantly enhances the anti-corrosive properties of the zinc film in the alkaline electrolyte of zinc-air batteries.

Keywords: anti-corrosive additive, alkaline electrolyte, electrolyte additive, sustainable energy, zinc-air battery.

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