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Zinc-Air Technology: A Proposal for Clean and Sustainable Energy Research

As the effects of anthropogenic climate destabilization manifest themselves in increasingly aggressive surges, a transition to a carbon neutral environment has become imperative. What is more, the present state of economic affairs in the United States demands a restorative and stimulating alternative to fossil fuels. This transition may be realized through the application of zinc-air technology. Consequently, an investigation of economic feasibility, capital expenses, and environmental costs has been instigated. In addition to providing an assessment of efficiency in present technology, experimental procedures have been designed and implimented to arrive at suggestions for improvement. Specifically, a comprehensive flowchart containing principles of electrochemistry particular to zinc-air primary batteries, fuel cells, and flow batteries has been assembled to distinguish between systems. Each device handles the demand for cycled energy with a unique mechanism. Primary batteries are discarded after the reactants are spent, whereas fuel cells are drained and reloaded with charged materials. The most ingtriguing of the three is the flow air battery (ZFAB), which aims to recharge its internal components by reversing current, and correspondingly, reduction-oxidation reactions. A significant interest has peaked in the realization of this capacity to recharge, which requires surmounting of obstructive dendritic formation and hydrogen evloution reactions.