

## Rechargeable metal-air batteries

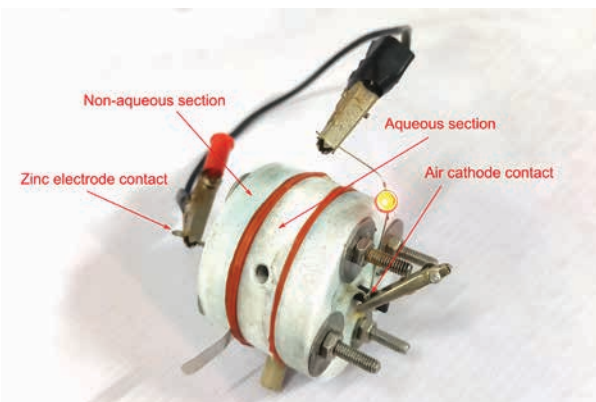
**Problem Statement:** Batteries are a missing link in the process of transitioning to renewable electricity. Rechargeable metal-air batteries can deliver a much higher capacity than the current batteries with Li-ion chemistry. However, metal-air batteries suffer from specific problems while achieving electrical rechargeability. The issues are mainly related to the reversibility of both the metal electrode and the air electrode reactions. The current invention aims to bypass the problems by applying a hybrid electrolyte design to ensure good reversibility at both the metal and the air electrode.

**Uniqueness of the Solution:** The current design completely decouples the reactions at the metal electrode and the air electrode using a third redox couple, making it possible to use an aqueous electrolyte at the air electrode while maintaining an aprotic environment at the metal electrode. The current invention aims to improve the rechargeability of metal-air batteries and therefore open a

possibility of their practical use for both portable and stationary applications.

**Current Status of Technology:** The team has fabricated a small cell and has performed charge-discharge experiments in a lab environment. They also fabricated a lab-scale prototype based on CuHCF as the auxiliary electrode material. A non-aqueous electrolyte is used for the metal electrode, and an aqueous electrolyte is used for the air electrode.

**Societal Impact:** Batteries are going to play a vital role in a power grid based completely on renewable resources. The current invention enables high voltage metal-air batteries as an electricity storage solution. Furthermore, the technology can be extended to several metal-air systems, including Na-air or K-air batteries.



**Patent(s):** Filed

**Relevant Industries:** Batteries, Clean Energy, Renewables.

**Faculty:** Prof. Arindam Sarkar, Chemical Engineering.