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Review identifies ways to improve zinc-air batteries

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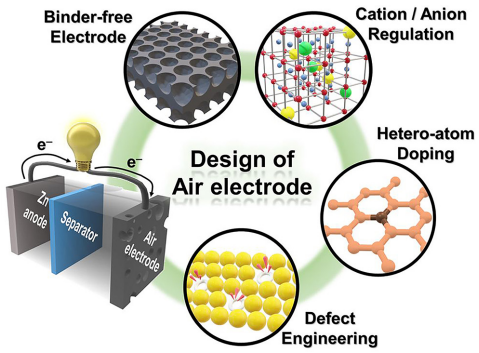
Researchers suggest four strategies for improving the design of air electrodes, working toward rechargeable zinc-air batteries.



With valuable applications in hearing aids and portable data loggers, zinc-air batteries (ZABs) already play an important role in society. A recent review by Tomboc et al. explores the future of ZABs and identifies the research required to expand their practical applications.

ZABs are currently limited by poor cyclability and low energy efficiency, which are caused by the current design of air-breathing electrodes.

“One critical issue that limits the practical application of zinc-air batteries is the large voltage gap between the charge and discharge processes, which is mainly attributed to the high overpotentials of oxygen reactions at the air electrode,” said author Jinghong Li.

The authors studied the catalytic center that controls the bifunctional catalytic activity of an oxygen catalyst, which is crucial to overcoming the limitations resulting from the different requirements of the cathode reactions.

“To extend the practical application of rechargeable ZABs, it is vital to develop a robust structural design that could provide accessible active sites to oxygen, electrolytes and electrons. It is rational to modify the overall structure of the air electrode,” said Li.

The authors identified a four part strategy for improving the design of the air catalyst in a ZAB, which includes engineering advantageous defects, regulating cations/anions in multi-component metal compounds, single or multi-hetero atom doping in carbon materials and the fabrication of binder-free air electrodes.

“This review points out the need to modify the overall structure of the air electrode of ZAB, which includes the bifunctional oxygen catalyst, gas diffusion layer, and conductive substrate,” said Li.

Source: “Ideal design of air electrode - A step closer towards robust rechargeable Zn-air battery,” by Gracita M. Tomboc, Peng Yu, Taehyun Kwon, Kwangyeol Lee, and Jinghong Li, *APL Materials* (2020). The article can be accessed at https://doi.org/10.1063/5.0005137.

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