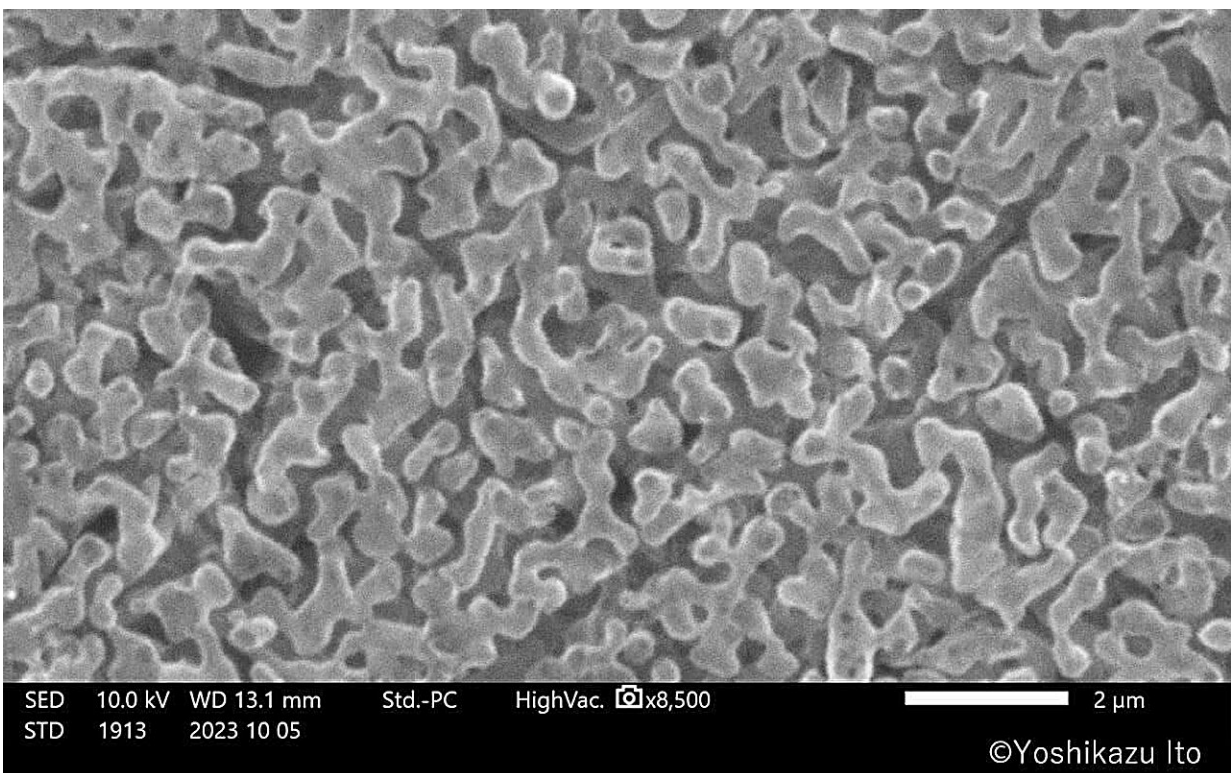


High-performance magnesium-air primary battery with nitrogen-doped nanoporous graphene as air electrodes

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Credit: University of Tsukuba

In pursuit of a carbon-neutral society, advancement of the battery technology becomes imperative. Primary batteries, though non-rechargeable, hold promise as power sources for sensors and disaster

scenarios because of their cost-effective production and voltage stability. However, most of these batteries employ expensive metal electrodes, such as lithium electrodes, necessitating exploration of alternative electrode materials.

Using carbon-based materials for the cathode, magnesium (Mg) for the anode, oxygen from the atmosphere as the cathode active material, and [brine](#) for the electrolyte, Mg-air primary batteries can be constructed using inexpensive and abundant materials. Theoretically, these batteries are expected to match [lithium-air batteries](#) with regard to performance. However, they do not perform well in terms of battery capacity and operational stability.

Researchers assembled a Mg-air primary battery using the prepared nitrogen-doped nanoporous graphene as the air cathodes and commercially available Mg sheets as the anodes, with a brine solution-soaked sodium polyacrylate gel constituting the solid electrolyte. Performance tests demonstrated that this battery exhibits comparable or superior performance to platinum [cathode](#)-based batteries. This is attributed to the porous electrode structure facilitating air transport as well as the ability of the [solid electrolyte](#) to prevent rapid corrosion of the Mg electrode.

The study, "[All-Solid-State Mg-Air Battery Enhanced with Free-Standing N-Doped 3D Nanoporous Graphene](#)," has been published in *Small*.

This achievement is expected to broaden the applications of primary air batteries and promote the utilization of primary air batteries comprising materials more cost-effective and readily available than platinum and lithium.

More information: Zeyu Xi et al, All-Solid-State Mg–Air Battery

Enhanced with Free-Standing N-Doped 3D Nanoporous Graphene, *Small* (2023). [DOI: 10.1002/sml.202308045](https://doi.org/10.1002/sml.202308045)

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