

Ultrathin Magnesium Metal Anode – An Essential Component for High-Energy-Density Magnesium Battery Materialization



Toshihiko Mandai



Hidetoshi Somekawa



Invited for this month's cover picture is the group from National Institute for Materials Science, Japan. The cover picture shows the rechargeable magnesium batteries incorporating ultrathin magnesium metal foils with the energy densities of 72 Wh kg^{-1} based on the weight of both cathodes and anodes. Read the full text of the article at 10.1002/batt.202200153

What is the most significant result of this study?

We successfully fabricated ultrathin magnesium foils applicable to practical rechargeable magnesium batteries (RMBs) for the first time by rolling an initial microstructure-controlled magnesium billet under the well-designed sound conditions. This work could be a step toward high-energy-density RMB materialization.

What do you consider the exciting developments in the field?

A variety of very fascinating materials, experimental techniques, and novel findings of rechargeable magnesium batteries are reported almost every week. They are highly attractive and some of them are somewhat promising; however, there are few research focusing on "practical" battery realization. Although the research of rechargeable magnesium batteries are still in the primitive stage hence developments of materials which can solve bottle-neck issues are necessary, the backcasting approaches must be considered to achieve practical rechargeable magnesium battery materialization.

What are the main challenges in the broad area of your research?

As described above, the individual battery components including cathodes, anode, and electrolytes are developing. However, the works reported full cell cycling tests under practical conditions with respect to the active materials loading, electrode sizes, amounts of injected electrolytes against electrode loading, charge-discharge rate, and so on are very

limited. Also, interfacial issues especially at magnesium anode-electrolyte (and separator) interfaces are considered to be problematic. The continuous, intensive works are still needed.

The image shows the front cover of the journal 'Batteries & Supercaps'. The cover features a 3D illustration of a magnesium anode. The anode is depicted as a thin, wavy sheet with numerous small, glowing spheres labeled 'Mg' representing magnesium atoms. To the left of the anode, there is a small electronic device with a digital display showing '72 Wh/kg' and a small lightning bolt icon, suggesting the energy density of the battery. The background of the cover has a subtle grid pattern. At the top right, the Chemistry Europe logo is present. At the bottom, the publisher 'WILEY-VCH' and the date '9/2022' are visible.

Who pays the bill for the research highlighted in the cover?

The authors greatly acknowledged the funding supports from the Advanced Low-Carbon Technology-Specially Promoted Research for Innovative Next Generation Batteries Program

(ALCA-SPRING, Grant Number JPMJAL1301) and the NEXT Center of Innovation Program (COI-NEXT, Grant Number JPMJPF2016) of the Japan Science and Technology Agency (JST). Authors also thank NIMS for the continuous supports.