

## YAGI LAB.

Let's think about it! The Science of Rechargeable Batteries



Research Center for Sustainable Material Energy Integration

Department of Materials Engineering,  
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Energy Storage Materials Engineering

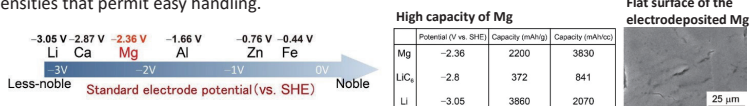
<https://www.yagi.iis.u-tokyo.ac.jp/en>

## Innovative Rechargeable Batteries and Highly Efficient Electrochemical Processes

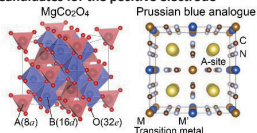
Yagi laboratory has developed rechargeable batteries from novel ideas and highly-active electrochemical catalysts composed of abundant elements for the growth of the sustainable society.

### Magnesium Rechargeable Battery

Magnesium has two valence electrons and the lowest standard electrode potential among the metals usable in air. The electrochemically deposited magnesium surface tends to be flat. We investigate magnesium battery technologies to achieve rechargeable batteries with high energy densities that permit easy handling.



Candidates for the positive electrode



Prototype of the Mg battery



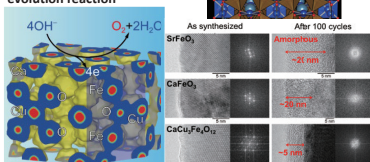
Analysis of the insertion/extraction behavior of Mg ions by electrochemical QCM



### Catalysts for Oxygen Electrochemical Reactions

Oxygen electrochemical reactions are significantly important and utilized in fuel cells, rechargeable metal-air batteries, electrochemical water splitting with renewable energy, and electrolytic smelting. We investigate highly active catalysts that use abundant elements to promote the oxygen electrochemical reactions.

Highly active oxide catalyst  
CaCu<sub>2</sub>Fe<sub>6</sub>O<sub>12</sub> for the oxygen  
evolution reaction



Bifunctional catalyst CaMn<sub>2</sub>O<sub>7</sub> active for both the oxygen  
evolution and reduction reactions

