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Press release

Kyoto University
Sumitomo Metal Mining Co., Ltd.

Joint Development of Photocatalyst for CO₂ Reduction with Approximately 30 Times Higher Conversion Efficiency than Previously

Kyoto University (Kyoto, Japan) and Sumitomo Metal Mining Co., Ltd. (TSE: 5713) have successfully developed a photocatalyst that can reduce carbon dioxide (CO₂) to carbon monoxide (CO) with approximately 30 times higher conversion efficiency than previous reports. This is a result of the "Sumitomo Metal Mining Industry-Academia Joint Course for the Effective Use of Carbon Dioxide" established on June 1st, 2022, by Kyoto University and Sumitomo Metal Mining, at the Graduate School of Engineering, Kyoto University.

The photocatalyst for CO₂ reduction, being researched and developed by the two parties, can convert CO₂ into chemicals such as CO, which can be used as a raw material for plastic products. The establishment of this technology is expected to make a significant contribution to the achievement of carbon neutrality by enabling not only the recycling of CO₂, a greenhouse gas, but also the production of plastics and other products using fewer petroleum resources.

The photocatalyst for CO₂ reduction consists of a semiconductor photocatalyst as the foundation and a cocatalyst to enhance the reaction. Here, the loading method, size, and structure of the cocatalyst were optimized by integrating the technical strengths of both parties; the catalyst synthesis and evaluation technologies, which Teramura's group has developed over many years (Department of Molecular Engineering, Graduate School of Engineering, Kyoto University), and powder synthesis and surface treatment technologies which are Sumitomo Metal Mining's core ones. In the case of a conventional zinc tantalate (ZnTa₂O₆) semiconductor photocatalyst modified with silver (Ag) nanoparticle cocatalysts, the CO concentration obtained by the photocatalytic conversion of CO₂ under ultraviolet light irradiation was limited to about 270 ppm. However, with the newly optimized catalyst, a high CO concentration over 8,000 ppm could be obtained, and approximately 30 times higher CO₂ conversion efficiency than previous reports was successfully achieved. This result was published online in the international academic journal ACS Catalysis on February 21st, 2025.

<https://pubs.acs.org/doi/10.1021/acscatal.4c06530>



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Kyoto University and Sumitomo Metal Mining will continue to work on research that will contribute to the achievement of carbon neutrality through a fusion of their respective technologies.

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