

# HU-ACE NEWS LETTER

Advanced Core for Energetics, Hiroshima University

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## Activities of the Core

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| Jan. 14, 2026 | The 125th Hiroshima University Biomass Evening Seminar.<br>(co-organized by HU-ACE)  |
| Jan. 15, 2026 | The 13th Geoseminer (organized by HU-ACE)  |
| Jan. 16, 2026 | The 111th HU-ACE Steering Committee Meeting  |
| Jan. 20, 2026 | The 20th Hiroshima University Biomass Premium Evening Seminar.<br>(co-organized by HU-ACE)   |
| Jan. 21, 2026 | Special Course on Carbon Recycling (NEDO Project):11th Session – CO <sub>2</sub> Fixation and<br>Its Application to Chemical Products [Advanced Course] (co-organized by HU-ACE) |
| Jan. 21, 2026 | HU-ACE General Meeting   |
| Jan. 24, 2026 | Higashihiroshima Energy & Eco Seminar – 8th Session: “Is It Possible to Create a<br>Sun on Earth? — Nuclear Fusion —” (co-organized by HU-ACE)                                   |

## A center-wide meeting of HU-ACE was held on January 21, 2025.

At this meeting, the current status of the center's operations was reviewed, and opinions were exchanged among center members to share perspectives on future directions of activities. In addition, an award ceremony was conducted to recognize achievements in academic publications. In this center, papers registered during the current fiscal year are evaluated, and awards are presented in three categories. For the Number of Publications category, Professor Fujiwara, Professor Namba, and Professor Suzuki received awards. For the Increase in Number of Publications category, Assistant Professor Kajimoto, Associate Professor Shimokuri, and Professor Fujiwara were recognized. For the Publication Growth Rate category, Assistant Professor Kajimoto, Associate Professor Shimokuri, and Professor Fujiwara received awards. Award certificates were presented to the awardees, who also received research funding support as supplementary prizes.

## Related Events

- Thu., Feb. 12, 14:00-16:00 The 146th Mechanical Systems Seminar.
  - Thu., Feb. 26, 16:20-17:50 The 126th Hiroshima University Biomass Evening Seminar.
  - Thu., Mar. 5, 13:00-16:30 The 32nd Hiroshima University Biomass Symposium
- Contact & more information: <https://hu-ace.hiroshima-u.ac.jp/en/>



### Research consultation and joint research are welcome.

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# Do You Know Energy?

## Metal Fuels

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**Keywords:** Metal Fuels, Dust Explosions, Gas Explosions, Hydrogen Safety, Microgravity Combustion



## What are Metal Fuels?

Metal fuels are a new energy concept in which metals such as iron and aluminum are burned to release energy.

When metals combust, they generate a large amount of thermal energy without emitting carbon dioxide (CO<sub>2</sub>); instead, they are converted into metal oxides.

These oxides can be converted back into metals using renewable energy, meaning that metal fuels are not “used once and discarded,” but can function as recyclable, circular energy carriers.

## What are the Key Characteristics of Metal Fuels?

In fact, metals such as aluminum powder have been used for many decades in applications like rocket propellants. This is because metals have extremely high energy densities and can generate large amounts of heat and thrust in a very short time—capabilities that have already been well demonstrated. From the perspective of terrestrial energy use, metals also offer a major advantage: they can be stored and transported safely under ambient temperature and pressure. Unlike electricity, they do not need to be consumed immediately, and unlike hydrogen, they do not require high-pressure or cryogenic storage. By combining high energy density with ease of handling, metal fuels are gaining renewed attention as a new form of energy that can complement the variability of renewable energy sources.

## Why is Research on Metal Fuels Important Now?

While the deployment of renewable energy sources such as solar and wind power is expanding in pursuit of a decarbonized society, it remains challenging to use energy “when and where it is needed.” Metal fuels offer the possibility of storing renewable energy in the form of metals and utilizing it as heat or electricity at the required location.

Moreover, because metal fuels do not emit CO<sub>2</sub> during combustion, they are being actively studied worldwide as a practical option for achieving both energy security and environmental sustainability.

## What Future Developments are Expected in Metal Fuel Research?

In the future, metal fuels are expected to be applied to large-scale energy storage, industrial heat sources, and power generation, as well as to circular energy systems combined with renewable energy. To realize these applications, technologies for safe and stable metal combustion, along with efficient reuse of metal oxides after combustion, are essential.

Research on metal fuels represents a challenge to deliver next-generation clean energy to society, built upon fundamental studies that seek to understand and control combustion phenomena that can otherwise become hazardous.