Advanced Core for Energetics, Hiroshima University Vol. 97

HU-ACE NEWS LETTER

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Activities of the Core

Jan. 14, 2025	The 3rd Energy Storage Seminars (organized by HU-ACE)
Jan. 16, 2025	The 118th Hiroshima University Biomass Evening Seminar (co-organized by HU-ACE)
Jan. 17, 2025	The 99th HU-ACE Steering Committee Meeting
Jan. 25, 2025	The 8th Higashi-hiroshima-Ene/Eco Seminar (co-organized by HU-ACE)
Jan. 28, 2025	HU-ACE General Meeting

We co-organized an international conference JCREN

In the field of energy, collaboration across various academic disciplines is essential. With this in mind, we co-hosted the 13th Joint Conference on Renewable Energy and Nanotechnology on January 11th and 12th, 2025. This international conference, held annually, aims to promote collaborative research through presentations from diverse fields. The hosting duties rotate among Japan, Thailand, and other countries. This year, Japan led the event, with Professor Minato Wakisaka from Fukuoka Women's University serving as the chair of the organizing committee.
The conference was conducted in a hybrid format, both at Fukuoka Women's University and via Zoom. On the second day, participants visited a recycling facility in Fukuoka City and enjoyed a sightseeing tour in Dazaifu. A total of 28 presentations, including two keynote speeches, were delivered by participants from six countries, leading to lively exchanges of ideas. Several presentations were made from our center, with Mr. Ken Furuta receiving the Best Poster Presentation Award.

Related Events

Mar. 21, 2025. 16:20-17:50 : The 10th Geo seminar (organized by HU-ACE)
Mar. 24, 2025. 13:00-17:00 : The 30th Hiroshima University Biomass Project Center Symposium (co-organized by HU-ACE)
Apr. 23, 2025. 16:20-17:50 : The 120th Hiroshima University Biomass Evening Seminar (co-organized by HU-ACE)
Jun. 30, 2025-Jul. 1, 2025: The 9th International Symposium on Fuels and Energy (ISFE2025)

Contact us for more information : hu-ace-info@ml.hiroshima-u.ac.jp

Research consultation and joint research are welcome.

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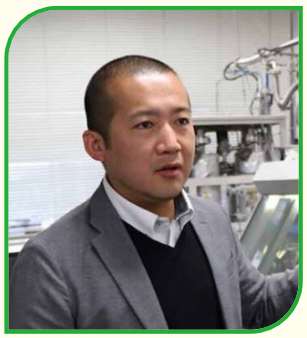
HU-ACE NEWS LETTER Advanced Core for Energetics, Hiroshima University Vol. 97

Research Topics

No. 60

Utilization of functional property of alkali metal — Innovative NH_3 synthesis H_2 production —



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Research fields: Material science, Material / Energy conversion

Keywords: Nitride synthesis, H_2 storage, H_2 production

Abstract

Background

To suppress CO_2 emission by using fossil fuels and overcome energy issues in future, enhancement of natural energy utilization is required. Various conversion techniques, which are production of H_2 as energy media and energy carrier such as NH_3 with high energy density, should be developed to establish energy system based on fluctuated and localized natural energy.

Methods

We focus on functional properties of alkali metals such as lithium (Li) and sodium (Na) and propose innovative material conversion techniques. Especially, small-scale and distributed type of low-pressure ammonia (NH_3) synthesis and High-capacity hydrogen storage/transportation systems are experimentally studied.

Results

The NH_3 synthesis techniques based on N_2 dissociation properties of Li and Na are proposed, and the reaction properties are experimentally and theoretically investigated by research team with Hokkaido Univ., Kumamoto Univ. and AIST. As a result, it was clarified that Na-group 14 elements alloys showed catalysis for NH_3 synthesis under 0.1-1.0 MPa [1]. Furthermore, it was demonstrated that NaH can be utilized as catalyst and reactant of chemical looping process for NH_3 synthesis.

Ammonolysis system composed of NH_3 and LiH is attractive hydrogen storage/transportation system because of its high hydrogen capacity and hydrogen desorption without input of thermal energy. Although kinetic improvement of hydrogen desorption reaction was one of issues, reaction kinetics was drastically improved by addition of small amount of NaH+NaI into LiH. As shown in Fig.1, the LiH+NaH+NaI sample showed about 90% of reaction yield for 1 h reaction and can desorb more than 6 wt.% of hydrogen.

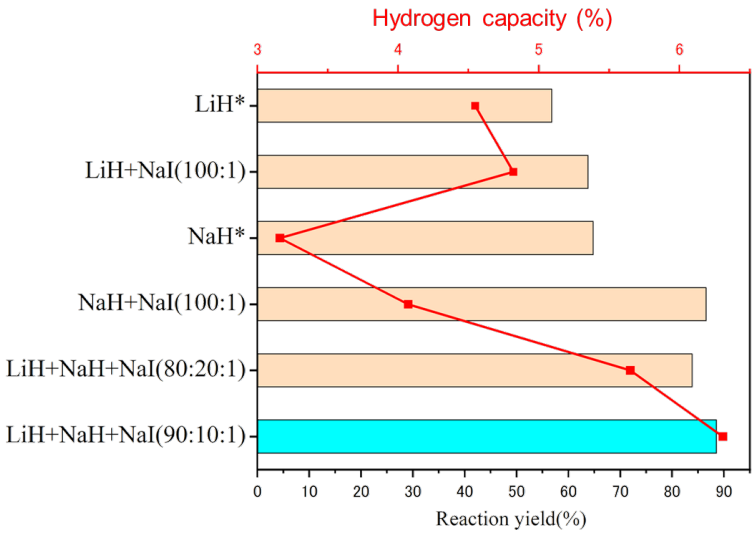

Fig.1 Reaction yield for 1 h reaction of samples

References

[1] Tsunematsu, K.; Shinzato, K.; Gi, H.; Tagawa, K.; Yamaguchi, M.; Saima, H.; Miyaoka, H.; Ichikawa, T.: *ACS Appl. Energy Mater.* **12**, 52 (2022)