Advanced Core for Energetics, Hiroshima University Vol. 96

HU-ACE NEWS LETTER

Advanced Core for Energetics, Hiroshima University

Vol.96
2024.12

Activities of the Core

Dec. 4, 2024	The Biomass Symposium 'Carbon Recycling through Biomass' (co-organized by HU-ACE)
Dec. 7, 2024	The 7th Higashihiroshima-Ene/Eco Seminar (co-organized by HU-ACE)
Dec. 16, 2024	The 98th HU-ACE Steering Committee Meeting
Dec. 24, 2024	The 16th Hiroshima University Biomass Premium Evening Seminar (co-organized by HU-ACE)
Dec. 26, 2024	The 9th Geo-seminar (organized by HU-ACE)

Asian Conference on Biomass Science (ACBS 2024)

HU-ACE co-organized the 12th Asian Conference on Biomass Science (ACBS2024), held on November 21-22, 2024, in Ho Chi Minh City, Vietnam. The venue was Ho Chi Minh City University of Technology, and around 80 participants discussed Asian biomass during the conference. Many of the attending researchers and students were from Vietnam, and there were various presentations related to the utilization of locally available biomass materials in Vietnam. The main organizing body was the Biomass Division, the Japan Institute of Energy. We would like to express our sincere appreciation for the great cooperation and support we received from the local organizing committee, who made ACBS2024 a great success.

Related Events

Jan. 25, 2025: 14:00-16:00 The 8th Higashihiroshima-Ene/Eco Seminar (co-organized by HU-ACE)
Feb. 1, 2025: 14:00-16:00 The 9th Higashihiroshima-Ene/Eco Seminar (co-organized by HU-ACE)
Feb. 19, 2025: 16:20-17:50 The 119th Hiroshima University Biomass Evening Seminar (co-organized by HU-ACE)
Contact us for more information : hu-ace-info@ml.hiroshima-u.ac.jp

Research consultation and joint research are welcome.

Issued by Advanced Core for Energetics, Hiroshima University
HU-ACE Secretariat, URA Division, Office of Research and Academia-Government-Community Collaboration, Hiroshima University 1-3-2 Kagamiyama, Higashi-Hiroshima, 739-8511 Japan
E-mail: hu-ace-info@ml.hiroshima-u.ac.jp, tel:+81-82-424-4425, URL: https://hu-ace.hiroshima-u.ac.jp/en/

HU-ACE NEWS LETTER Advanced Core for Energetics, Hiroshima University Vol. 96

Research Topics

No. 59

Anti-oxidation effect of Cr for TiFe hydrogen storage alloys

Fangqin Guo

Assistant Professor in the Mechanical Engineering Program, Graduate School of Advanced Science and Engineering

Research fields:
materials science and materials engineering.

Keywords: Hydrogen storage, Anti-oxidation, Cr substitution and Kinetics.

Abstract

Background

Hydrogen storage alloys are promising choices for solid-state hydrogen storage with the advantages of high volumetric hydrogen storage capacity, reversibility, and safety for utilization. TiFe is an appealing hydrogen storage option with a relatively high hydrogen storage capacity (~1.87 wt%) under moderate conditions with applicable plateau pressure at room temperature. However, the main obstacle of TiFe for practical applications is the laborious treatment required to promote initial hydrogen absorption and remove the oxide layers and impurities adhered to the active surface of TiFe alloy. Here, we use element substitution to improve the kinetics and an-oxidation properties of TiFe hydrogen storage alloys.

Methods

In this experiment, $TiFe_{0.9}Cr_{0.1}$ and TiFe hydrogen storage alloys were prepared by arc melting. The structural and kinetic properties of TiFe and Cr-substituted TiFe alloys are investigated and compared to understand the anti-oxidation effects of Cr. The chemical state of TiFe and $TiFe_{0.9}Cr_{0.1}$ during the degradation process was analyzed by X-ray photoelectron spectroscopy (XPS) to understand the anti-oxidation effect of Cr addition for TiFe hydrogen storage alloys.

Results

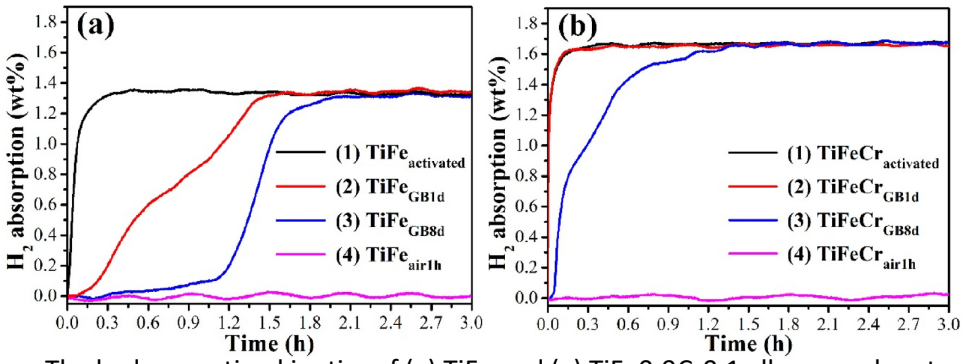

Figure. The hydrogenation kinetics of (a) TiFe and (a) TiFe0·9Cr0.1 alloy samples at room temperature (296 ± 1 K) under 3.1 MPa initial hydrogen pressure

As shown in the figure, the hydrogen absorption kinetic measurements of $TiFe_{0.9}Cr_{0.1}$ and TiFe hydrogen storage alloys were performed to clarify the effect of Cr substitution for Fe on the anti-oxidation properties of TiFe-based alloys. The kinetics of TiFe after Cr substitution have been improved, and the anti-oxidation properties have also been enhanced. Based on all the results and discussion as listed in the paper, the substituting Cr significantly improves the anti-oxidation properties of TiFe alloys.

References

1. Zhiwen Chen, Fangqin Guo , et al. Journal of Alloys and Compounds, 1008, 15, pp. 176634, 20240920