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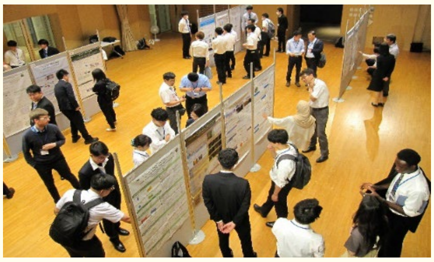
Activities of the Core

July. 1-2, 2024	The 8th International Symposium on Fuels and Energy (ISFE2024) (organized by HU-ACE).
July. 6, 2024	The 3rd Higashi-Hiroshima Energy Eco Seminar "The University's Challenge to Zero Carbon " (organized by HU-ACE).
July. 22, 2024	The 1st Energy Storage Seminars (organized by HU-ACE)
July. 25, 2024	The 93rd HU-ACE Steering Committee Meeting
July. 25, 2024	Kids Energy Symposium 2024 (co-organized by HU-ACE).
July. 31, 2024	The 115th Hiroshima University Biomass Evening Seminar (co-organized by HU-ACE)

ISFE2024 was held in hybrid format

The 8th International Symposium on Fuels and Energy (ISFE2024), hosted by the ISFE Organizing Committee and the Advanced Core for Energetics at Hiroshima University (HU-ACE), was successfully held on July 1 and 2 at the Higashi-Hiroshima Arts & Culture Hall "KURARA." The symposium employed a hybrid format utilizing Zoom to connect online presenters and participants with the onsite venue, leading to lively discussions. We had 6 keynote lectures, 3 invited lectures, 18 oral presentations, and 26 poster presentations, with a total of 73 participants from 8 countries. On the afternoon of Day 2, a session was held that included keynote lectures and a comprehensive discussion on energy and mobility in the carbon-neutral era, promoting discussions and information exchange on the Hiroshima scenario for sustainable energy use. We would like to thank all participants and those who supported the preparation and operation of ISFE2024.



Related Events

The 9th International Symposium on Fuels and Energy (ISFE2025) is scheduled on June 30- July 2, 2024. Details will be announced later.

We have constructed a roadmap for the development of energy utilization technologies leading up to 2050 and an integration scenario called the “Hiroshima Scenario”. Please feel free to share your thoughts with us.
https://hu-ace.hiroshima-u.ac.jp/wp/wp-content/uploads/2022/10/220921-brochure.pdf

Research consultation and joint research are welcome.

Issued by Advanced Core for Energetics, Hiroshima University
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Research Topics

Study on Ignition and Burn Dynamics of Laser Fusion ～ *Toward thd Realization of Fusion Reactor*～

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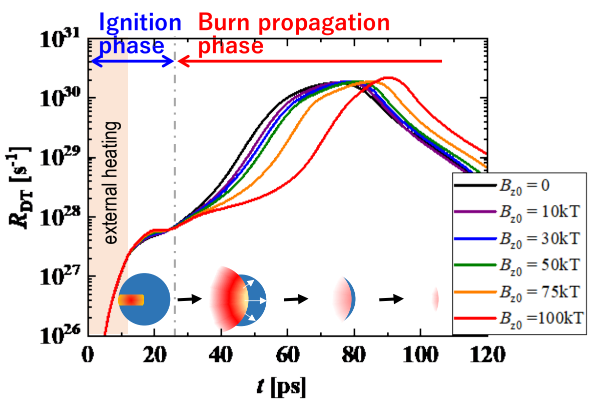
Research fields: Laser Inertial Fusion, Laser High Energy Density Physics
Keywords: Fast Ignition Laser Fusion, Ignition and Burn Dynamics, Numerical Simulations

Abstract

Background: More than half a century has already passed since thermonuclear fusion began in the 1960s to realize the ultimate energy source. In recent years, its early realization is expected as a carbon-free energy source. The fusion breakeven, where the fusion output energy exceeds the input energy to initiate the fusion reaction, was achieved for the first time in the world as controlled thermonuclear fusion on December 5, 2022, at the National Ignition Facility (NIF) at Livermore National Laboratory in the U.S. The NIF adopts a laser inertial fusion scheme. In laser inertial fusion, a few millimeter-long diameter fuel sphere is imploded by irradiation of an MJ-class laser to achieve a density several thousand times higher than the solid density. Although fusion ignition has been achieved, there are still many scientific and engineering issues to be solved in order to realize a fusion power reactor. On the other hand, in recent years, many private companies have started up around the world, claiming early realization of fusion reactors. In Japan, also, the public and private sectors are working together to accelerate the realization of fusion reactors.

Research: In the ignition and burning processes of laser fusion, multi-phasic complex physical phenomenon involving plasma fluid motion, fusion reaction and energy transports by fusion products, radiation and heat occurs in 100 μm & 100 ps scales. Our research, focuses on fusion ignition and burn dynamics to clarify the physical mechanisms and improve the efficiency through code development, numerical and theoretical analysis, and comparison with experiments in collaboration with domestic and international researchers and institutions.

In a fast-ignition laser fusion scheme, a relativistic ultra-intense laser is irradiated onto the pre-compressed fusion fuel to heat it up to the ignition temperature (~100 million degrees) in an extremely short time. Our research group focuses on this scheme. We are developing the electron beam guiding scheme by self-generated and externally applied magnetic fields [1,2] and evaluating the effect of magnetic fields on ignition and burn dynamics [3] for DT (D; deuterium, T: tritium) fuel, which has the highest feasibility of fusion burning among various fusion fuels. Also we are evaluating ignition and burn characteristics of advanced fuels [4] that produce less or no neutrons in the reaction, although the realization of ignition and burnup is much more difficult than with DT fuels.



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