第 135 回機械システムセミナー

第 137 回広大 ACE セミナー

Combustion of iron powder: From fundamental to applications

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URL：第 135 回機械システムセミナー（第 137 回広大 ACE セミナー）：Combustion of iron powder: From fundamental to applications
講演者：Prof. XiaoCheng Mi

Prof. XiaoCheng Mi is an assistant professor in the Power and Flow Section, Department of Mechanical Engineering, Eindhoven University of Technology (TU/e). He received his PhD degree in Mechanical Engineering at McGill University (Canada) in 2018. His doctoral dissertation is on "*Detonation in spatially inhomogeneous media*". From 2018 to 2020, he was supported by the Canadian NSERC Postdoctoral Fellowship to pursue a postdoctoral study on detonation of multiphase energetic materials at the Centre for Scientific Computing (CSC), Cavendish Laboratory, University of Cambridge (UK). From 2020 to 2021, he did his second postdoctoral research on metal combustion at the Alternative Fuel Laboratory (AFL), McGill University. He received the *John H.S. Lee Young Investigator Award* at the 27th International Colloquium for Dynamics of Explosions and Reactive Systems (ICDERS) in 2019. He is also an organizer of the Young Researchers' Forum on Detonation (YRF-Det) and the 1st Workshop on Metal-enabled Cycle of Renewable Energy (MeCRE) at TU/e in November 2022. His research interests include metal combustion and pressure-gain combustion (enabled by gaseous detonation).

講演概要：次ページの Abstract を参照下さい.
参加費　：無料

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Abstract

The energy crisis gripping our society is not primarily due to a lack of renewable sources, but rather stems from the mismatch between the continuous demand for energy and the geographically scattered and temporally intermittent supply from these sources. In response to this challenge, the scientific community is actively exploring reliable and efficient energy storage alternatives. One promising solution is the Metal-enabled Cycle of Renewable Energy (MeCRE), which aims to address the sustainable, long-distance transport, and long-term storage of clean energy. At the forefront of MeCRE, micrometric iron powder has emerged as a promising candidate due to its combination of high energy density, zero-carbon footprint, and reducibility by hydrogen gas. When combusted, iron powder not only produces useful power and heat but also leaves behind oxide products in the form of readily collectible micrometric particles. The subsequent reduction of these oxide particles by hydrogen gas enables the storage of clean energy, regenerating the iron powder for cyclic use. However, transforming this promising concept into a tangible reality presents challenges, necessitating an expansion of our fundamental knowledge. This presentation consists of three parts: (I) An introduction to the concept of MeCRE and why iron powder is a good energy carrier; (II) state-of-the-art development of pilot iron-fuel combustors; (III) fundamental knowledge of how iron particles burn in air and some outstanding challenges in real-world combustors.