- 主 講 人: Professor Tomomasa OHKUBO 東京工科大學 工學部機械工學科
- 講題: From Sunlight to Lasers, and Lasers to Heat: Exploring Solar-Pumped Lasers and Advanced Laser Heating Techniques
- 摘 要: 如附件
- 主 持 人: 陳瑞琳教授
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## From Sunlight to Lasers, and Lasers to Heat: Exploring Solar-Pumped Lasers and Advanced Laser Heating Techniques

Professor Tomomasa OHKUBO 東京工科大学 工学部機械工学科

This talk introduces two independent applications of laser technology: solar-pumped lasers and high-temperature laser heating. Although unrelated in their specific mechanisms and purposes, both represent novel approaches to utilizing the unique properties of lasers.

The first part focuses on solar-pumped lasers, a technique that converts concentrated sunlight directly into laser emission. By combining large Fresnel lenses and custom-designed solar concentrators, our research group has achieved world-record efficiencies. These systems offer a sustainable path toward energy applications and remote power transmission in future space missions.

The second part highlights our development of laser-based heating systems for evaluating high-temperature materials such as SiC/SiC ceramic matrix composites. With precise laser scanning and AI-driven control, we are developing a new thermal testing method capable of rapidly and locally heating test specimens to over  $1400^{\circ}$ C — a challenge for conventional furnaces.

Together, these efforts showcase the versatility of laser science across energy and materials engineering domains.

Tomomasa OHKUBO received his B.S. degree in Applied Physics and M.S. and D.S. degrees in Energy Science from the Tokyo Institute of Technology, Tokyo, Japan, in 2001, 2003, and 2006, respectively. In 2024, he was promoted to Professor in the Department of Mechanical Engineering at the Tokyo University of Technology. Prior to this, he served as an Associate Professor in the same department. From 2006 to 2007, he was a Specially Appointed Assistant Professor at the Integrated Research Institute, Tokyo Institute of Technology, and from 2007 to 2014, he worked as an Assistant Professor in the Department of Mechanical Engineering at Tokyo Institute of Technology. His research interests lie in the field of laser engineering, with a particular focus on laser heating, solar-pumped lasers, laser processing, and laser propulsion.

In 2003, as a first-year doctoral student, he conducted a short-term research stay at the Institute of Applied Mechanics, National Taiwan University, under the supervision of Prof. Chin-Chou CHU. During this period, he developed software for Particle Image Velocimetry (PIV). This experience inspired his continued interest in fostering academic exchange between Taiwan and Japan. Since then, he has been steadily studying Chinese to deepen his connections with Taiwan.

He has received several awards throughout his career, including the Outstanding Presentation Award from the Japan Society of Mechanical Engineers, Power and Energy Systems Division, the Excellent Poster Award from the Japan Laser Processing Society, the Best Oral Presentation Award at the 2nd International Conference on Advanced Technology and Sustainable Development, and the Best Presentation Award at ISCIIA & ITCA 2018. In addition, the students that he supervised have also garnered numerous awards, bringing the total count to over 20.

He is recognized as one of the leading experts in solar-pumped lasers in Japan, having set the world record for solar-pumped laser efficiency three times. His research in this field has been supported by grants from prestigious organizations, including the JSPS KAKENHI, the TEPCO Memorial Foundation, the Transcosmos Foundation, the Suzuki Foundation and the Yashima Foundation.

In recent years, he has been developing new laser-based heating techniques and participated in Japan's national project, the Second Term of the Cross-ministerial Strategic Innovation Promotion Program (SIP), led by the Cabinet Office. He was also selected for NEDO(New Energy and Industrial Technology Development Organization)'s Intensive Support Program for Young Promising Researchers, where he led projects integrating

laser heating with AI to pioneer new advancements.

