

Solar thermal energy: From power generation to kerosene synthesis

Wojciech Lipiński
Research School of Engineering
Australian National University
wojciech.lipinski@anu.edu.au
<http://stg.anu.edu.au>



Abstract

High-flux solar irradiation obtained with optical concentrators is an excellent source of clean process heat for high-temperature physical and chemical processing. Solar thermal power generation, the area which has traditionally driven developments in concentrating solar technologies, has the unparalleled potential for large-scale dispatchable employment and experiences renewed interests by researchers and industry. The emerging field of solar thermochemistry aims at direct thermochemical production of solar chemical fuels and commodity materials. Cheap and efficient solar production of synthesis gas, the precursor to synthetic drop-in hydrocarbon fuels such as petrol, diesel and kerosene, is an intriguing approach to transform today's fossil-based to tomorrow's renewable-based transportation sector. In the most ambitious scenario, synthesis gas is obtained from sunlight, water and captured carbon dioxide.

This presentation will give an overview of recent developments in high-temperature solar thermal processing, from basic research to applications. Fundamental investigations in physical optics, thermal transport and materials science will be reviewed along with examples of selected solar receiver and reactor developments.

Biography:

Wojciech Lipiński received his MSc Eng degree from the Warsaw University of Technology (2000), and doctorate (2004) and habilitation (2009) from ETH Zurich. Currently, he is an Associate Professor and the Leader of the Solar Thermal Group at the Australian National University, and a Privatdozent at ETH Zurich. He previously held Senior Research Associate and University Lecturer positions in the Department of Mechanical and Process Engineering at ETH Zurich, and an Assistant Professor position in the Department of Mechanical Engineering at the University of Minnesota. His research interests are in thermal and thermochemical sciences, optics, and energy, environmental and space technology applications. Lipiński has published over 90 articles in peer-reviewed journals and conference proceedings, and contributed to several books, edited books and e-books. He was awarded the 2006 Hilti Award for Innovative Research from ETH Zurich, the College of Science and Engineering 2010–2011 Outstanding Professor Award from the University of Minnesota, and the 2013 Elsevier/JQSRT Raymond Viskanta Award in Radiative Transfer. Since 2011, he has served as the Associate Editor in Bioconversion and Solar Chemistry for the ASME Journal of Solar Energy Engineering, and the Elected Member of the Scientific Council of the International Centre for Heat and Mass Transfer. Lipiński is a member of AAAS, ACS, AIAA, AIChE, ASME, EPS, ISES, and OSA.