X-REPORTS IN THERMAL SCIENCE AND ENGINEERING

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Introduction to X-Reports

In recent years, the thermal science and engineering field has greatly expanded and now overlaps with other branches of science, such as physics, material science, biomedical science, nanotechnology, big data, and artificial intelligence. High-level interdisciplinary research demands closer connections and cooperation among global researchers working on a wide range of subjects. Webcam meetings enable global scholars to easily come together to discuss and cooperate on these crucial topics. The X-Reports aim to invite distinguished professionals from various disciplines and countries to give cutting-edge/breakthrough lectures on an interactive platform to encourage new ideas and promote innovations in thermal science and engineering.

6th X-Report

Prof. Shigeo Maruyama

The University of Tokyo, Japan

Title: Thermal and Energy Challenges with 1D-Heterostructures based on Single-Walled Carbon Nanotubes

Time: 15:30-17:30 pm, Dec. 26 (Beijing Time), 2020

Webinar Meeting Code No.: 636 7247 7119(ZOOM ID)

Website: http://www.xreports.org

Abstract

Recently, we have successfully realized the synthesis of one-dimensional (1D) van der Waals heterostructures, with single-walled carbon nanotube (SWCNT) as a template [1]. A typical 1D heterostrucure is composed of coaxial SWCNT, boron nitride nanotube (BNNT), and molybdenum disulfide nanotube (MoS2NT), which should be a promising building block of the electronics and optoelectronic devices. At the same time, the enhanced thermal conductance of the thin film made of BNNTs over SWCNTs [2] is very promising for macroscopic applications of heterostructures. Because BNNT coating over SWCNT film will not influence the transparency in the visible range, those films are immediately applicable for a saturable absorber in mode-lock fiber lasers or a pellicle membrane in extreme ultraviolet (EUV) lithography. The mechanism of the enhancement of thermal conductance from a film of SWCNTs will be discussed in detail. On the other hand, full heterostructure film composed of SWCNT-BNNT-MoS2NT is expected to be employed as active layer, hole-transport-layer, or transparent electrode of next generation solar cells [3]. The preliminary application in the perovskite solar cells shows considerable advantage over SWCNT films [4]. The SWCNT-based transparent electrode is practically useful in perovskite-Si tandem solar cells. The current tandem solar cells with total power conversion efficiency (PCE) more than 27 % will be discussed.

References:

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