7th Special Issue on the Workshop on Next-generation Front-edge Optical Science Research

Preface

The increasing number of applications of ionizing radiation in many indusrtial and scientific application fields, such as homeland security, monitoring the environment for radioactive contamination, medical imaging, radiotherapy, well logging, and high-energy physics, is stimulating demand for the development of new radiation detection and measurement techniques using luminescent materials. Such luminescent materials are roughly classified into two types: scintillators and storage phosphors. Scintillators are materials with the capability to convert energy from ionizing radiation into thousands of low-energy photons commonly known as ultraviolet–visible light immediately after the absorption of ionizing radiation via electromagnetic interactions. They can be used as survey meters, X-ray computed tomography (CT) scanners, and time-of-flight position emission tomography (TOF-PET) detectors. Storage phosphors can accumulate the energy of ionizing radiation as a form of carrier trapping within several weeks. There are at least three types of storage phosphors: thermoluminescence (TL), optically stimulated luminescence (OSL), and radiation-induced photoluminescence (RPL) materials. These storage phosphors are mainly used in individual personal dosimeters and imaging plates. In this special issue, we focus on such luminescent materials for ionizing radiation detection and measurement as well as on new analysis methods for material characterization that use ionizing radiation.

The Workshop on Next-generation Front-edge Optical Science Research showcases recent achievements in this field from the viewpoint of phosphor material physics and chemistry for ionizing radiation detectors and sensing applications. The 1st, 2nd, 3rd, 4th, 5th, and 6th special issues were published in 2015 (7 papers, Vol. 27, No. 3), 2016 (12 papers, Vol. 28, No. 8), 2017 (11 papers, Vol. 29, No. 10), 2018 [12 papers, Vol. 30, No. 7(2)], 2019 [10 papers, Vol. 31, No. 4(2)], and 2020 [17 papers, Vol. 32, No. 4(2)], respectively. For this 7th special issue, 17 papers have been accepted pending mandatory changes and final examination by the guest editors. This special issue presents recent developments in sensor technology for ionizing radiation, especially in academic research.

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Yutaka Fujimoto
Tohoku University
Japan

Takayuki Yanagida
Nara Institute of Science and Technology
Japan