

**10TH SPECIAL ISSUE ON THE WORKSHOP ON NEXT-GENERATION
FRONT-EDGE OPTICAL SCIENCE RESEARCH AND JSAP FRONTIER RESEARCH GROUP
OF EXTREME EXCITATION AND QUANTUM ENERGY CONVERSION**

PREFACE



Ionizing radiation detection and measurement techniques play important roles for many years and provide a wide range of benefits to our daily life. Notable examples include nuclear and particle physics research, medical imaging, radiotherapy, diffraction experiments, nondestructive testing, homeland security, archeology, and well logging. The continuous development of applications has stimulated a large demand for an increased understanding of the fundamental properties of luminescence materials and the development of novel materials with superior performance. Luminescence materials for ionizing radiation detectors are roughly classified into two types: scintillators and storage phosphors. Scintillators are materials with the function of detecting ionizing radiation and instantaneously converting it to low-energy photons, commonly known

as UV–visible light, via electromagnetic interactions. The emitted light is generally recorded as an electrical signal with a photosensitive detector such as a photomultiplier tube (PMT) or Si-based photodiode. Storage phosphors can accumulate the energy of ionizing radiation in the form of trapped carriers over several weeks. There are at least three types of storage phosphors: thermoluminescence (TL), optically stimulated luminescence (OSL), and radiophotoluminescence (RPL) dosimeter materials. The irradiation dose can be measured from the TL, OSL, or RPL intensity, which is proportional to the concentration of trapped carriers. In this special issue, we focus on the use of such luminescence materials based on various forms, from single crystals to transparent ceramics, nanoparticles, and amorphous materials, for ionizing radiation detectors, monitoring, and imaging systems.

The Workshop on Next-generation Front-edge Optical Science Research and JSAP Frontier Research Group of Extreme Excitation and Quantum Energy Conversion demonstrate recent achievements in this field from the viewpoints of phosphor material physics and

chemistry for ionizing radiation detectors and sensing applications. Seven papers were published in the first special issue in 2015 (7 papers, Vol. 27, No. 3), followed by those in 2016 (13 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)], 2020 [17 papers, Vol. 32, No. 4(2)], 2021 [17 papers, Vol. 33, No. 6(4)], 2022 [22 papers, Vol. 34, No. 2(2)], and 2023 [16 papers, Vol. 35 No. 2(2)]. For this 10th special issue, 21 papers have been accepted pending mandatory changes and final examination by the guest editor. This special issue presents the recent development of novel materials for ionizing radiation detection and measurement, especially in academic research.

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