



Ru-Shi Liu

Narrow Emission Band Phosphors for the Application in LEDs

**Department of Chemistry, National
Taiwan University
Email: rslu@ntu.edu.tw**

Light-emitting diodes (LEDs) are widely used around the world. Scientists are attempting to develop LED devices that do not only have high brightness but also have a high color rendering index (CRI). Phosphor materials play important roles in tuning and optimizing the final luminescent spectrum. Narrow-band emission phosphors must be incorporated into LED chips to achieve high CRI and efficacy. From this perspective, we introduce and discuss key points in the narrow-band emission spectrum. Three sets of phosphor examples, namely, Eu^{2+} -doped $(\text{Ba}, \text{Sr})\text{Si}_2\text{O}_2\text{N}_2$, UCr_4C_4 -type structures, and β - SiAlON systems, are used to explain these points. First, we discuss the highly symmetrical local coordination environment of activators, which include cuboid and nine-coordinate structures. Second, we reveal the second shell effect of the substituted cation channel. Third, we discuss the interaction between the electron from the activator and the vibration from the host lattice (electron-lattice interaction). These model systems help establish and design rules for narrow-band emission phosphors and may guide future studies in discovering potential phosphor candidates for practical applications.

SHORT BIO:

Professor Ru-Shi Liu received his Bachelor degree in Chemistry from Soochow University (Taiwan) in 1981. He got his Master Degree in nuclear science from the National Tsing Hua University (Taiwan) in 1983. He obtained two Ph.D. degrees in Chemistry from National Tsing Hua University in 1990 and from the University of Cambridge in 1992. He joined Materials Research Laboratories at Industrial Technology Research Institute as an Associate Researcher, Research Scientist, Senior Research Scientist and Research Manager from 1983 to 1995. Then he became an Associate Professor at the Department of Chemistry of the National Taiwan University from 1995 to 1999. Then he promoted as a Professor in 1999. In July 2016, he became the Distinguished Professor. He got the Excellent Young Person Prize in 1989, Excellent Inventor Award (Argentine Medal) in 1995 and Excellent Young Chemist Award in 1998. He got the 9th Y. Z. Hsu scientific paper award due to the excellent energy saving research in 2011. He received the Ministry of Science and Technology award for distinguished research in 2013 and 2018. In 2015, he received the distinguished award for Novel and Synthesis by IUPAC & NMS. In 2017, he got the Chung-Shang Academic paper award. In 2018 he received the highly cited researchers by Clarivate Analytics and Hou Chin-Tui Award. His research is concerning in the Materials Chemistry. He is the author and co-author of more than 560 publications in scientific international journals with total citations > 14,838, h-index: 63. He has also granted more than 200 patents.