Structure, Luminescence and Application of a Robust Carbidonitride Blue Phosphor ($Al_{1-x}Si_xC_xN_{1-x}$:Eu^{2+}) for Near UV-LED Driven Solid State Lighting

Le Wang,[†] Xiaojun Wang,[‡] Takashi Takeda, [‡] Naoto Hirosaki,[‡] Yi-ting Tsai,[§] Ru-Shi Liu,[§, $] Rong-Jun Xie[‡, ⊥] *

[†]College of Optical and Electronic Technology, China Jiliang University, Hangzhou, Zhejiang 310018, China

[‡]Sialon Group, Sialon Unit, Materials for Environment and Energy Division, National Institute for Materials Science (NIMS), Namiki 1-1, Tsukuba, Ibaraki 305-0044, Japan

[§]Department of Chemistry, National Taiwan University, Taipei 106, Taiwan

[$] Department of Mechanical Engineering and Graduate Institute of Manufacturing Technology, National Taipei University of Technology, Taipei 106, Taiwan

[⊥]College of Materials, Xiamen University, No. 422 Siming-nan Road, Xiamen, Fujian 361005, China

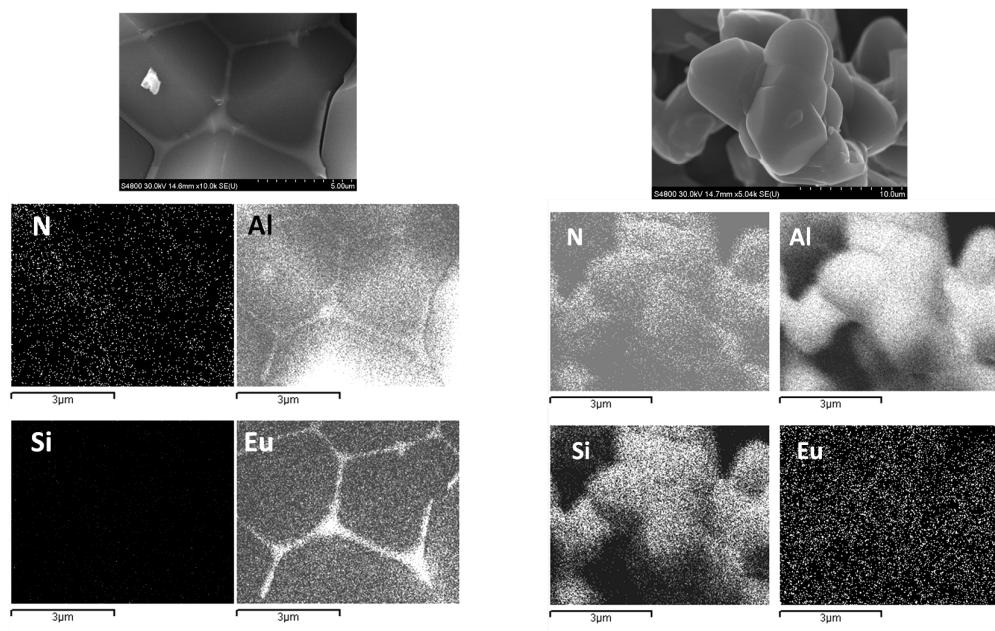* Xie.Rong-Jun@nims.go.jp

EDS mapping

Fig. S1

EDS mapping of $Al_{1-x}Si_xC_xN_{1-x}$:Eu_y samples with x = 0 (left) and x = 0.06 (right)

Excitation spectra
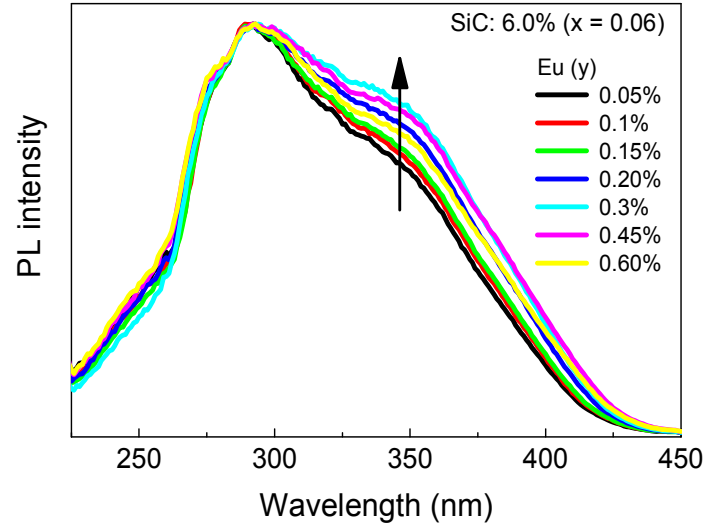
Fig. S2

Excitation spectra of $Al_{1-x}Si_xC_xN_{1-x}$:Eu_y samples (x = 0.06) with varying Eu2+ concentrations, only showing the enhanced right wing of the spectra.

Emission spectra

Fig. S3
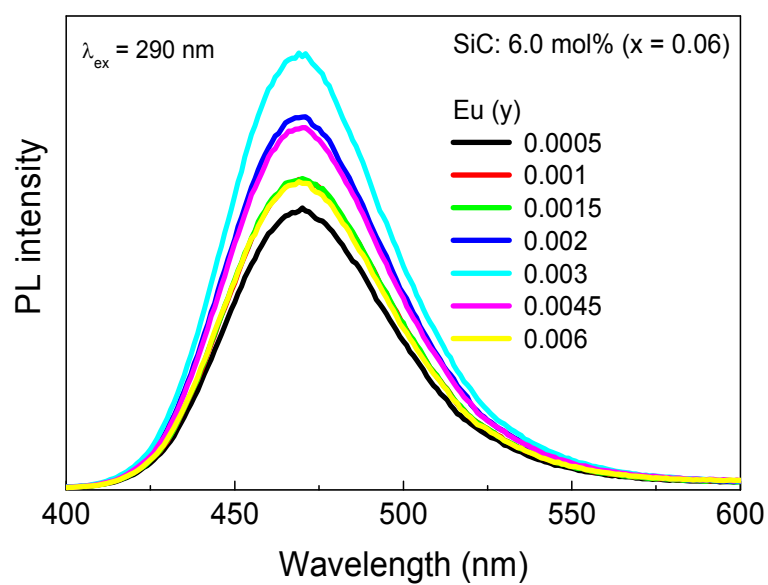
Emission spectra of $Al_{1-x}Si_xC_xN_{1-x}$:Eu_y samples (x = 0.06) with varying Eu^{2+} concentrations, indicating no shifts in peak emission as the Eu^{2+} concentration increases.
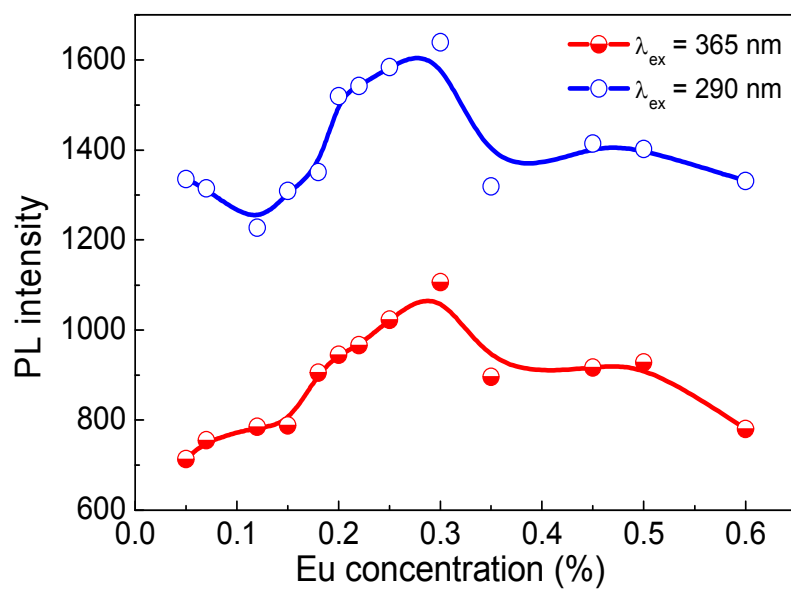
Concentration quenching

Fig. S4

Concentration quenching of $Al_{1-x}Si_xC_xN_{1-x}$:Eu_y samples (x = 0.06), showing the optimal concentration of y = 0.003 (0.3 mol%).
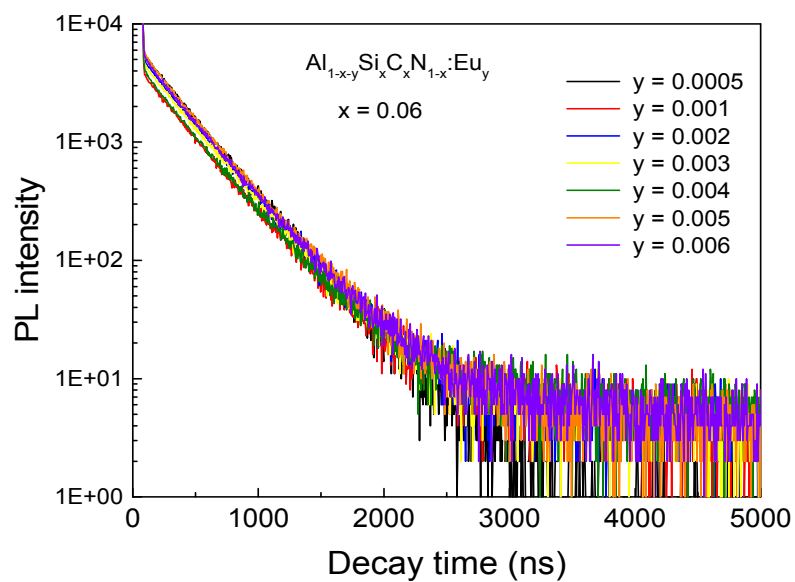
Decay time

Fig. S5

Decay curves of $Al_{1-x}Si_xC_xN_{1-x}$:Eu_y samples (x = 0.06) with varying Eu^{2+} concentrations, showing a single exponential decay of luminescence intensity.