Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.
This journal is © the Owner Societies 2022

Electronic Supplementary Information

Deep-red to near-infrared luminescence from Eu^{2+}-trapped exciton states in $YSiO_2N$

Yuuki Kitagawa,[a] Jumpei Ueda,[a] Jian Xu,[b] Takayuki Nakanishi,[c] Takashi Takeda,[c] Naoto Hirosaki,[c] Setsuhisa Tanabe[a]*

[a] Department of Interdisciplinary Environment, Graduate School of Human and Environmental Studies, Kyoto University, Kyoto 606-8501, Japan

[b] International Center for Young Scientists (ICYS), National Institute for Materials Science (NIMS), Tsukuba, Ibaraki 305-0044, Japan

[c] Luminescent Materials Group, National Institute for Materials Science (NIMS), Tsukuba, Ibaraki 305-0044, Japan

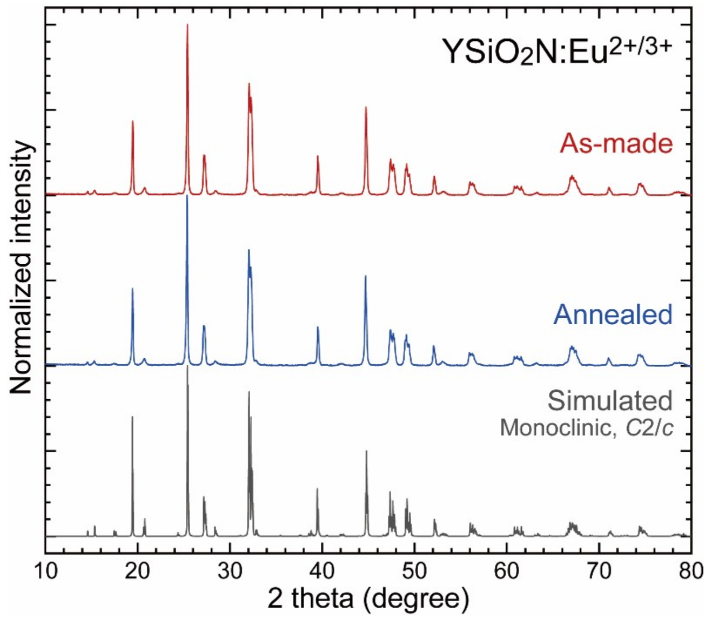

Fig. S1 XRD patterns of the as-made and annealed $YSiO_2N:Eu^{2+/3+}$ sample with the reference data of monoclinic $YSiO_2N$ (space group: *C*2/*c*).

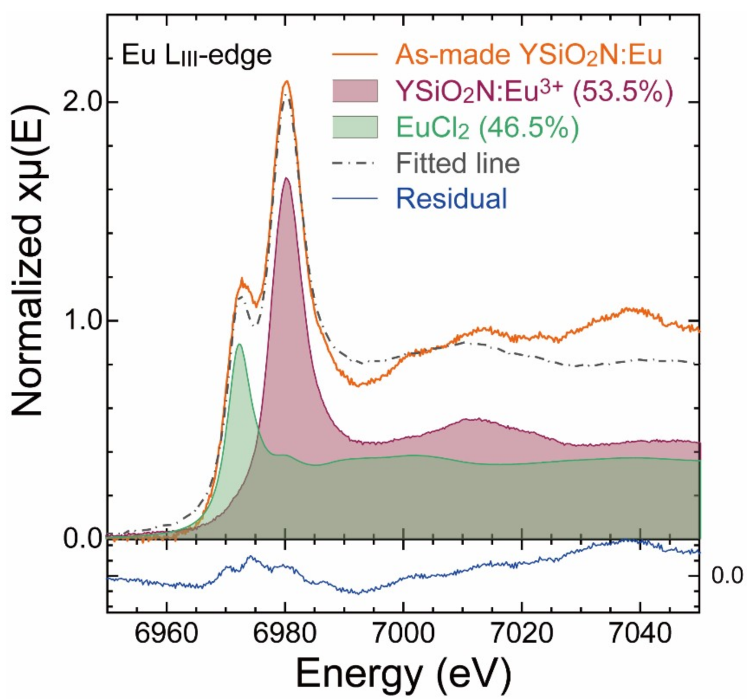

Fig. S2 XANES spectra of the as-made sample, fitted with the spectra of the annealed $YSiO_2N:Eu^{3+}$ sample and $EuCl_2$ chemical to estimate the ratio between Eu^{2+} and Eu^{3+} ions.

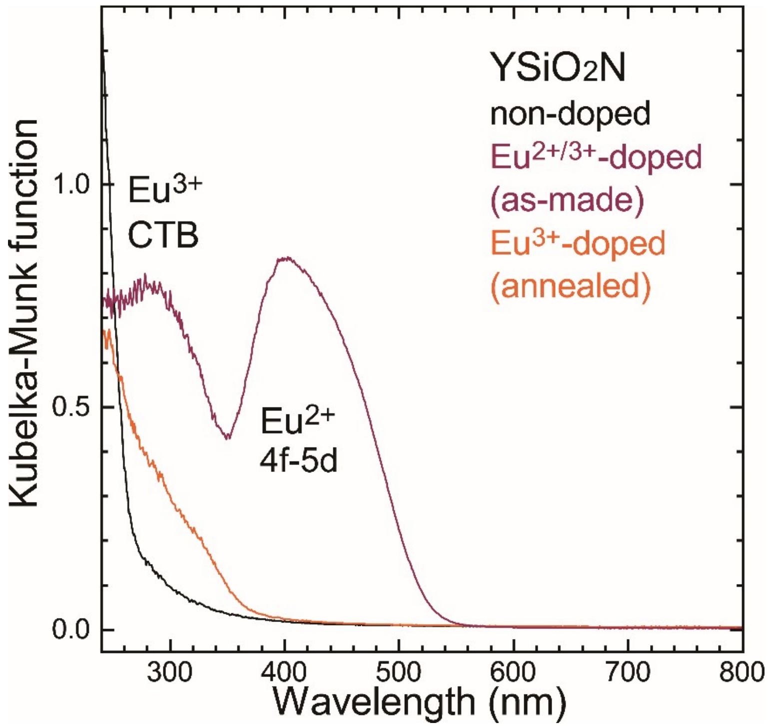

Fig. S3 Diffuse reflectance spectra of the non-doped $YSiO_2N$, as-made $YSiO_2N:Eu^{2+/3+}$, and annealed $YSiO_2N:Eu^{3+}$ samples. The vertical axis is converted to the Kubelka-Munk function.

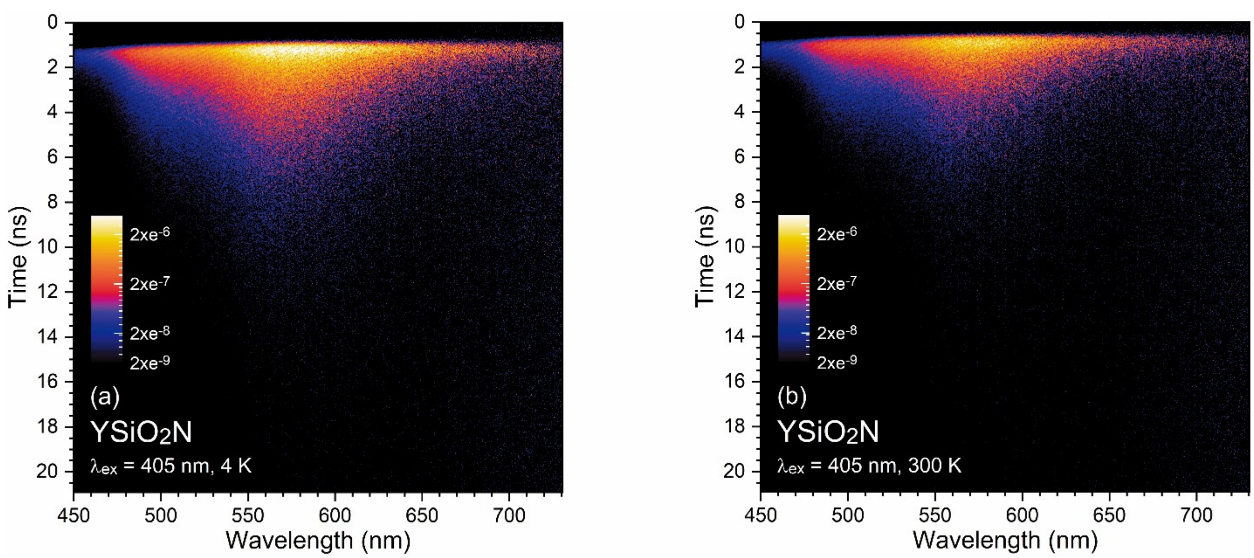

Fig. S4 Time-resolved PL spectra of the non-doped $YSiO_2N$ sample at 4 and 300 K.

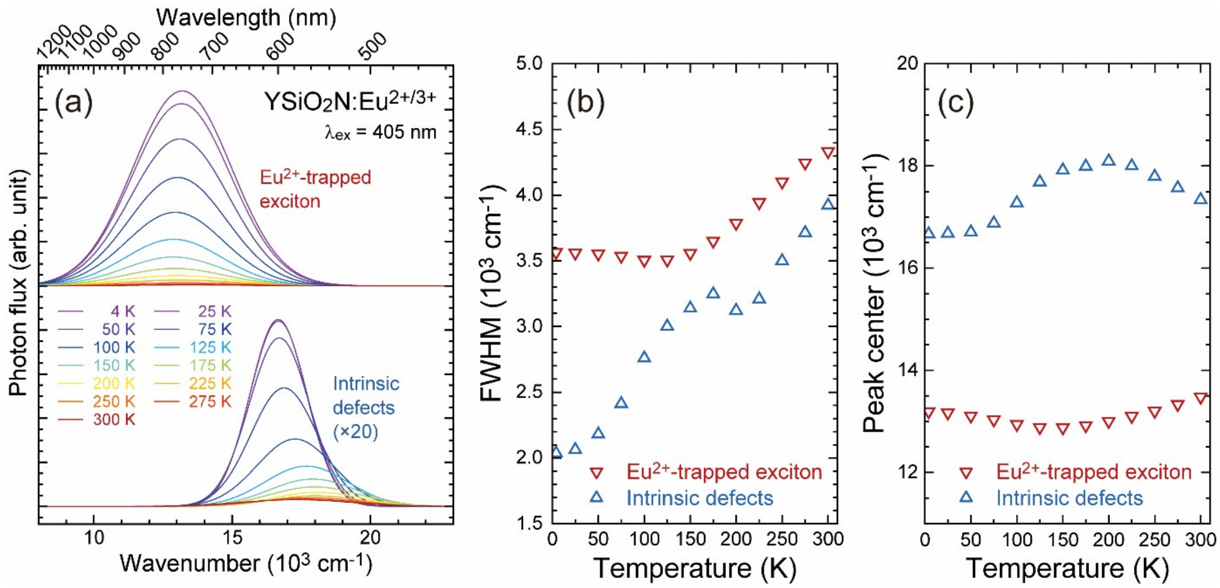

Fig. S5 (a) Gaussian profiles obtained by fitting of the PL spectra at low temperatures (T = 4–300 K). (b–c) Fitting outputs of FWHM and peak center for the Gaussian profiles of Eu^{2+}-trapped exciton and intrinsic defects emission.

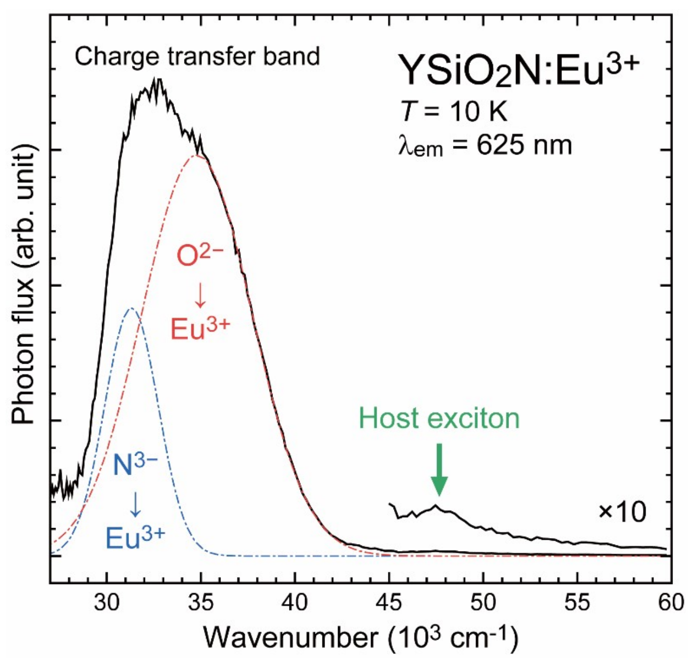

Fig. S6 PLE spectrum of the annealed $YSiO_2N:Eu^{3+}$ sample at 10 K. The broad excitation band was deconvoluted into two Gaussian profiles, assigned to the CT transition from N^{3-} and O^{2-} to Eu^{3+} ions.