Supporting information

Journal of Materials Chemistry C

$Y_2Si_4N_6C:Ce^{3+}$ Carbidonitride Green-Yellow Phosphors: Novel Synthesis, Photoluminescence Properties, and Applications

Jieqiong Wan[abc], Qian Liu*[ab], Guanghui Liu[ab], Zhenzhen Zhou[ab] and Rong-Jun Xie*[d]

[a]State Key Laboratory of High Performance Ceramics and Superfine Microstructure, Shanghai Institute of Ceramics, Chinese Academy of Sciences, 1295 Dingxi Road, Shanghai, 200050, China.

[b]Shanghai Institute of Materials Genome, 99 Shangda Road, Shanghai 200444, China

[c]University of Chinese Academy of Sciences, 19A Yuquan Road, Beijing 100049, China

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

Authors to whom correspondence should be addressed:

Email: qianliu@sunm.shcnc.ac.cn

XIE.Rong-Jun@nims.go.jp

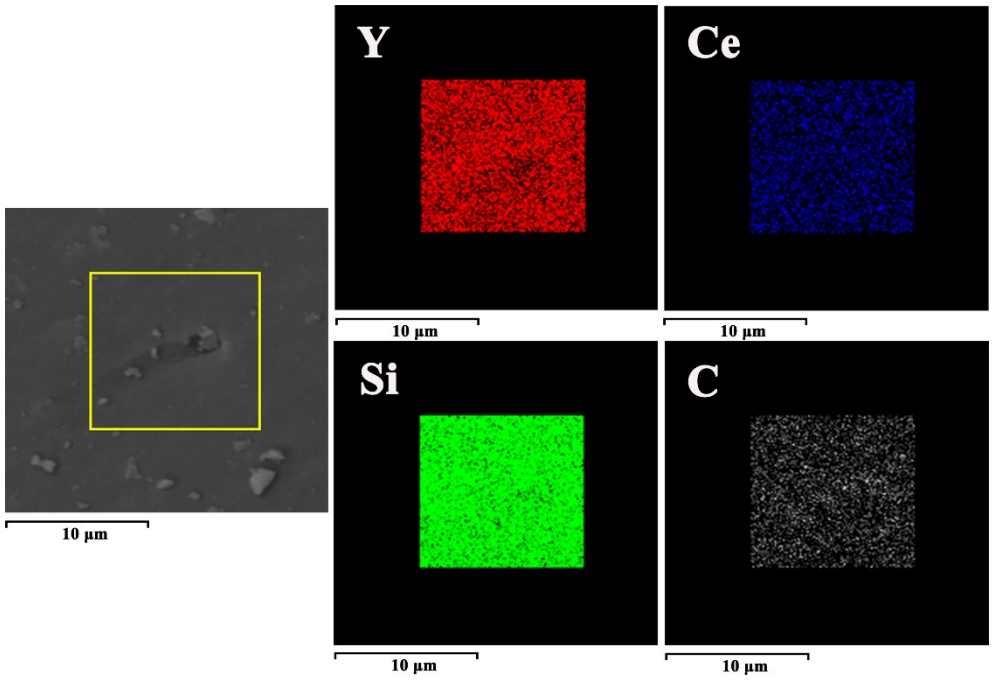

Figure S1 The selected area of SEM image and Y, Ce, Si, C elemental mapping of the carbonized precursor.

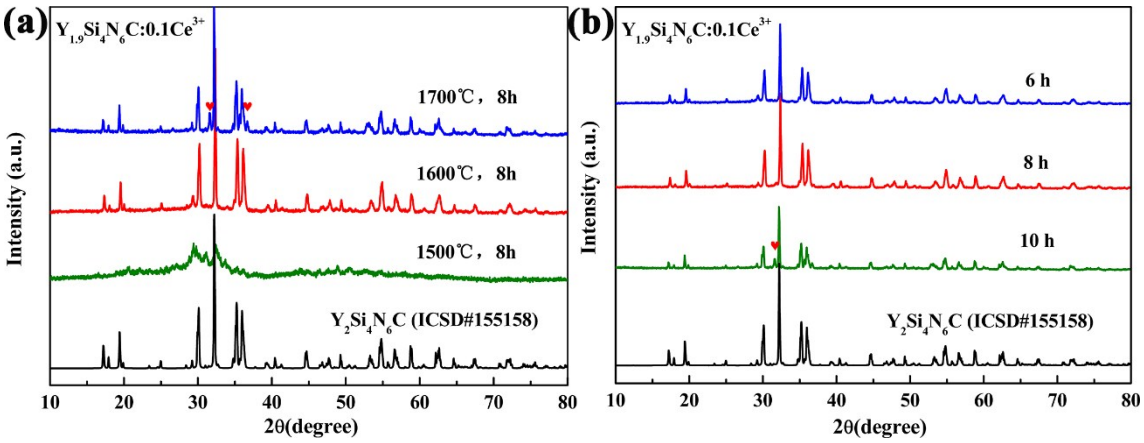

Figure S2: XRD patterns of $Y_{1.9}Si_4N_6C:0.1Ce^{3+}$ synthesized at (a) varying temperatures from 1500 °C to 1700 °C, (b) various heating time from 6 h to 8 h.

Figure S2a shows the XRD patterns of $Y_{1.9}Si_4N_6C:0.1Ce^{3+}$ samples synthesized at various temperatures ranging from 1500 °C to 1700 °C. At lower 1500 °C, two broad bands were detected indicating that the powders haven't well crystallized and have no typical diffraction peaks of $Y_2Si_4N_6C$ phase（ICSD#155158）. When calcination temperature increases to 1600 °C, XRD patterns of the obtained powders match well with ICSD standard card, testifying high phase purity of $Y_2Si_4N_6C$ phosphors prepared successfully. When further improved to 1700 °C, a little YN impurity phase (marked with red ♥) is detected, which may be due to the decomposition of $Y_2Si_4N_6C$ at high temperatures. Thus the synthesis temperature of 1600 °C is fixed as an optimal heat-treatment condition. Secondly, the calcination time is set by a variation of 6 h-8 h, seen in figure S2b. With calcination at 1600 °C for 6 h and 8 h, the well crystallized and pure $Y_2Si_4N_6C$ is obtained, while at longer 10 h, an impurity phase of YN is detected. Consequently, the optimized calcination time is set as the shorter 6 h.

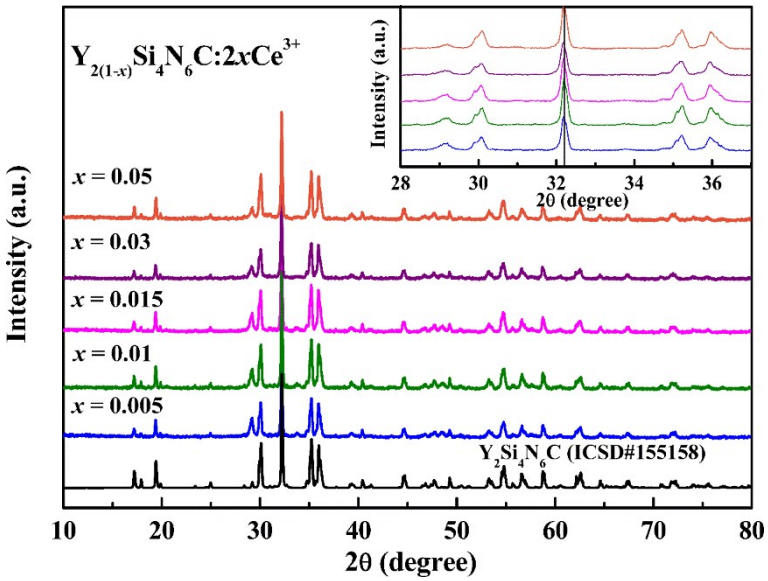

Figure S3: XRD patterns of $Y_{2(1-x)}Si_4N_6C:2xCe^{3+}$ with varied Ce^{3+} dopant concentration (x =0.005-0.05).

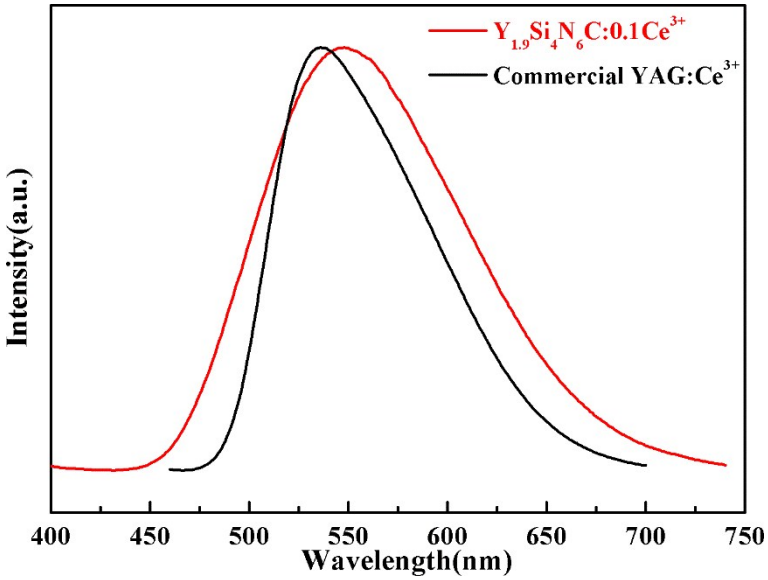

Figure S4: Emission spectra of $Y_{1.9}Si_4N_6C:0.1Ce^{3+}$ and commercial YAG:Ce^{3+} phosphors as a reference.