Ce doped $Sr_{4-x}Li_y(Si,Al)_{19+x}(N,O)_{29+x}$, an efficient and thermally stable deep blue-emitting phosphor for white LED application

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A new Eu doped $Sr_{4-x}Li_y(Si,Al)_{19+x}(N,O)_{29+x}$ phosphor has recently been discovered with the single-particle-diagnosis approach.[1-2] The new phase crystallizes in trigonal structure with space group P3m1 This phosphor can be effectively excited with near-UV light and shows blue to green emission with varying Eu concentration.[3]

In this work, we report the synthesis and photoluminescence properties of Ce doped $Sr_{4-x}Li_y(Si,Al)_{19+x}(N,O)_{29+x}$ phosphor. A powder sample with high phase purity has been obtained with a solid-state reaction method. The Ce doped new Sr-sialon phosphor shows deep blue emission (424 – 445 nm) after near-UV light excitation. Compared to Eu doped new Sr-sialon phosphor, the Ce doped one has better thermal stability and higher quantum efficiency. When the temperature is increased from 25 °C to 300 °C, there is still 54% of luminescence left. An internal efficiency up to 64% (by 355 nm excitation) can be achieved for a 5% Ce doped new Sr-sialon phase sample. For high color rendering white LED application, Ce doped new Sr-sialon phase phosphor is therefore promising.

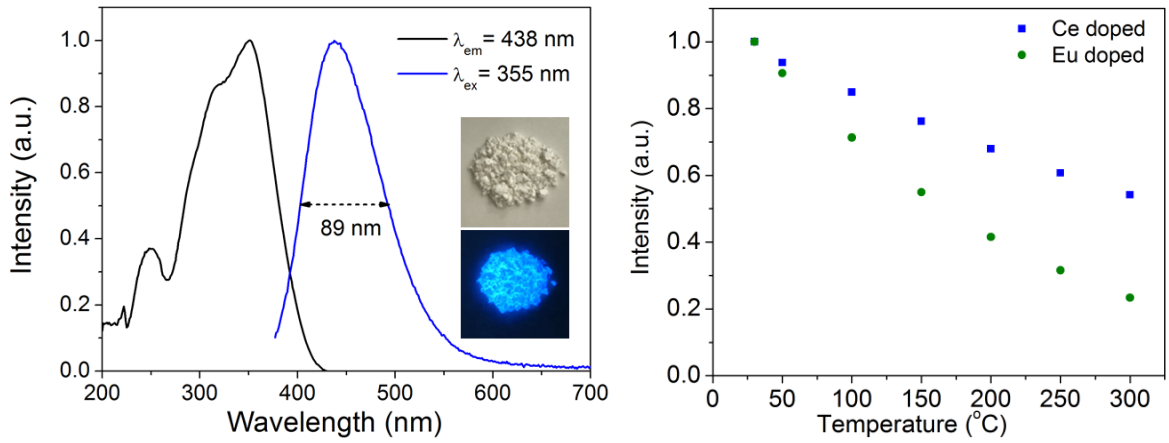

Fig. 1 Photoluminescence spectra of 5% Ce doped $Sr_{4-x}Li_y(Si,Al)_{19+x}(N,O)_{29+x}$ phosphor (left) and temperature dependency of the luminescence intensity with Ce and Eu doping (right).

[1] N. Hirosaki, T. Takeda, S. Funahashi, R.-J. Xie, *Chem. Mater.*, 2014, 26, 4280-4288.

[2] S. Funahashi, T. Takeda., N. Hirosaki, R.-J. Xie, *the 64th JSAP Spring Meeting*, 14a-411-4, Yokohama, 2017.

[3] T. Takeda, C.-Y. Wang, S. Funahashi, R.-J. Xie, N. Hirosaki, *the 64th JSAP Spring Meeting*, 14a-411-5, Yokohama, 2017.