Supporting Information

Laser-Driven NIR Light Source Based on MgO:Cr^{3+},Ni^{2+} Phosphor-In-Glass Film for NIR Spectroscopy Application

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Measurement and characterization details

For decay curves, the emission was monitored at 1330 nm and the excitation wavelength was fixed at 455 nm. The measurement data were fitted well with single-exponential decay model, as expressed with in the following formula[1, 2]:

$$I_{(t)} = A * exp(-t/\tau) + I_0$$

Where $I_{(t)}$ and I_0 stand for the photoluminescence intensity at time t and initial time, respectively. A is the constant value and τ is the decay time.

The calculated decay times of MgO:Cr^{3+},Ni^{2+} phosphor and PIGF were 2.2835 and 2.1780 ms, respectively. Keeping three significant digits, they were 2.28 and 2.18 ms, respectively, as listed in the manuscript.

For quantum efficiency tests, a beam of light at 650 nm was used to get a proportionality coefficient between visible and NIR detectors due to 650 nm can be detected by the two detectors. The internal quantum efficiency η can be calculated via the following formula[3, 4]:

$$\alpha = \frac{\int I_{vis,650}}{\int I_{NIR,650}}$$

$$\eta = \frac{\int I_{sample}}{\int A_{ref} - \int A_{sample}}$$

Herein, $I_{vis,650}$ and $I_{NIR,650}$ refer to the emission spectra of 650 nm detected by visible and NIR detectors, respectively. $I_{,sample}$ is the emission spectra of sample when excited by 455 nm, A_{ref} and A_{sample} are the reflection spectra of $BaSO_4$ reference and sample when 455 nm input, respectively.

The thermal conductivity was measured through laser flash method. The test temperature was 298 K. Thermal conductivity (λ) was calculated by the following equation:

$$\lambda = \rho \times c \times \alpha$$

Here, ρ, c and α are density, specific heat capacity and thermal diffusivity, respectively.

Density is obtained by dividing mass by volume and mass and volume were measured by Electronic balance (BSA224S-CW) and Digital thickness meter, respectively. Specific heat capacity was measured by Differential scanning calorimeter (DSC 204F1) and thermal diffusivity was measured by Laser thermal conductivity meter (LFA467).

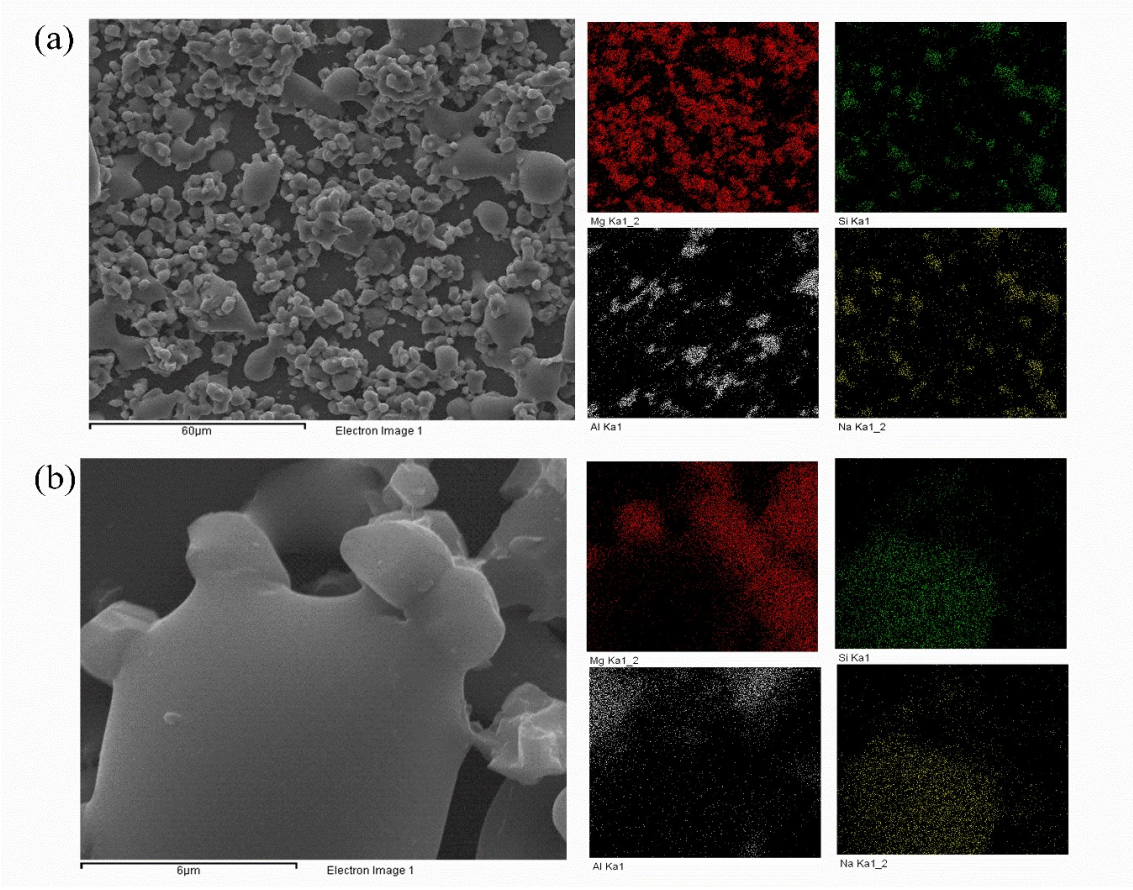

Fig. S1 The SEM images and elements mapping of Mg, Si, Al, Na on (a) 80 wt%-1L sample and (b) one enlarged part.

Reference

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