

Supporting Information for

Ca₃Sc₂Si₃O₁₂: Ce³⁺, Cr³⁺, Li⁺ Phosphor-in-Glass Film for High-power Laser-Driven Near-infrared Lightings

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Table S1. Comparison of the emission peak (λ_{em}), NIR output powers (P_{out}) and conversion efficiencies (CE) based on laser-driven NIR illumination and LED-driven NIR illumination.

| Compound | λ_{em} (nm) | P_{out} (W) | CE (%) | Ref. |
|--|---------------------|---------------|--------|-----------|
| $Ca_3Sc_2Si_3O_{12}: Ce^{3+}, Cr^{3+}, Li^+$ | 780 | 1.697 | 9.78 | This work |
| $Gd_3Al_2Ga_3O_{12}: Cr^{3+}$ | 732 | 1.650 | 30.0 | 1 |
| $Gd_3Al_{1.5}Sc_{0.5}Ga_3O_{12}: Cr^{3+}$ | 752 | 0.920 | 14.0 | 2 |
| $Na_3GaF_6: Cr^{3+}, Li^+$ | 758 | 0.970 | 20.9 | 3 |
| $Gd_3Sc_{1.5}Al_{0.5}Ga_3O_{12}: Cr^{3+}$ | 762 | 0.750 | 7.70 | 4 |
| $Ga_{1.7}(Zn-Ge)_{0.3}O_3: Cr^{3+}$ | 768 | 0.630 | 20.0 | 5 |
| $KAlP_2O_7: Cr^{3+}$ | 790 | 0.080 | 7.91 | 6 |
| $Ca_3MgHfGe_3O_{12}: Cr^{3+}$ | 805 | 0.120 | 7.20 | 7 |
| $KGaP_2O_7: Cr^{3+}$ | 812 | 0.470 | 10.7 | 8 |

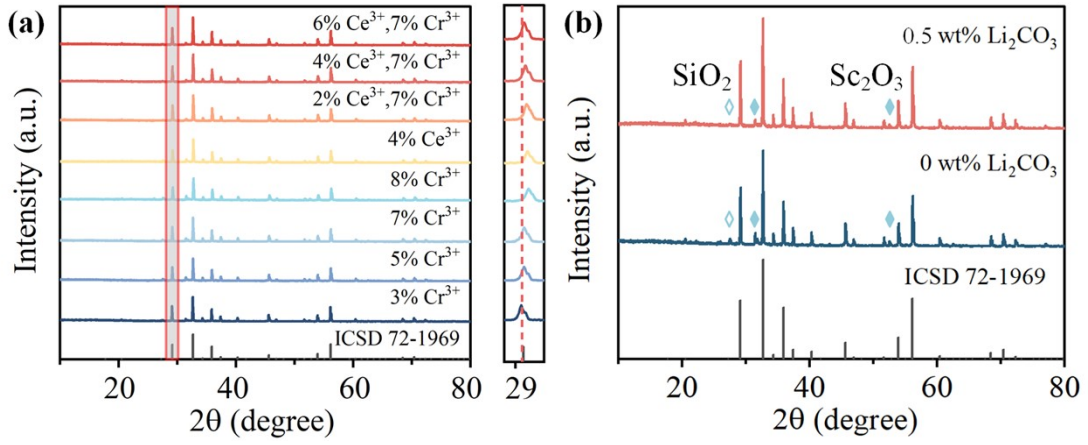


Figure S1. XRD patterns of (a) CSSO: x%Cr, CSSO: y%Ce, 7%Cr and (b) CSSO: 7%Cr with 0 wt% or 0.5 wt% Li₂CO₃.

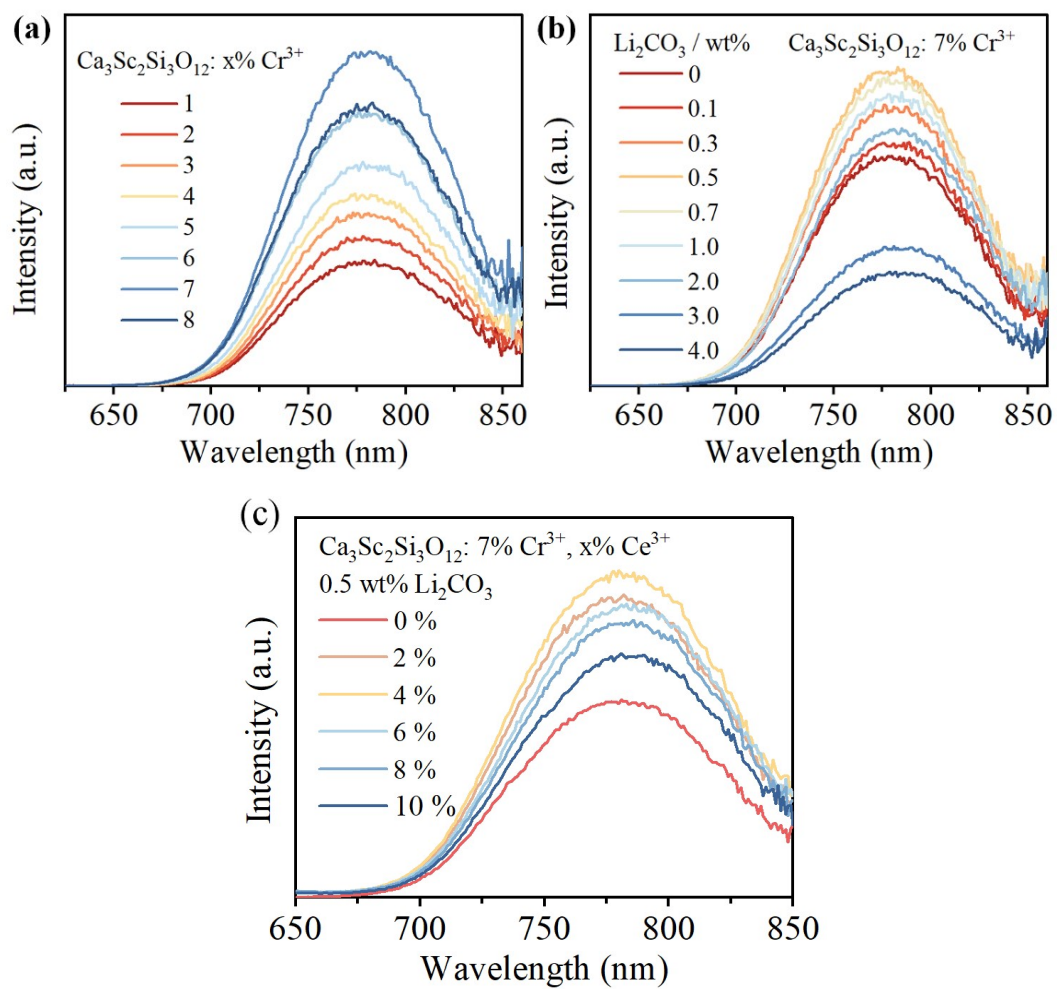


Figure S2. The luminescence intensity of the different doping of Ce^{3+} , Cr^{3+} and Li^+ for phosphor.

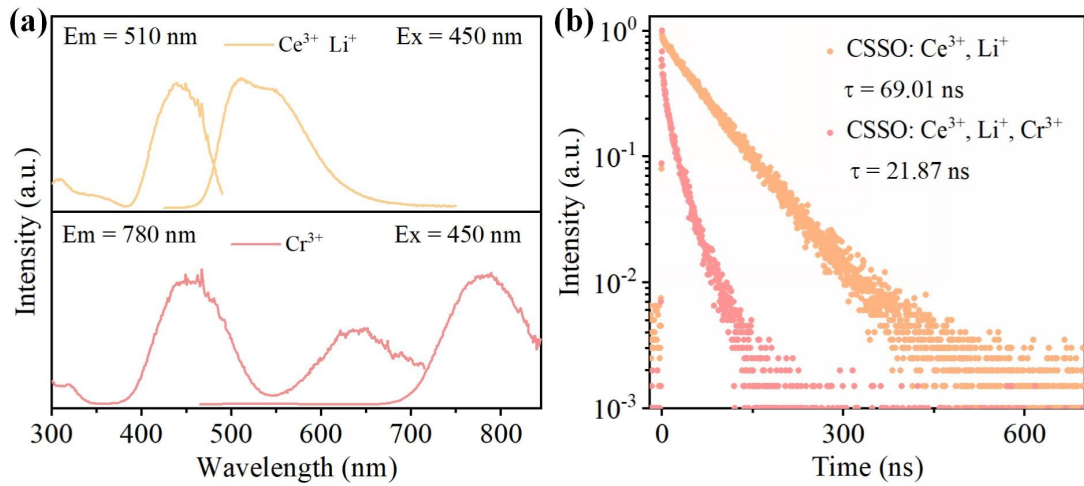


Figure S3. (a) The excitation and emission of CSSO:Cr³⁺ and CSSO:Ce³⁺, Li⁺ samples both of which can be excited by 450 nm laser. (b) Luminescent decay curves of CSSO:Ce³⁺, Li⁺, Cr³⁺ phosphor powder and CSSO:Ce³⁺, Li⁺ phosphor powder.

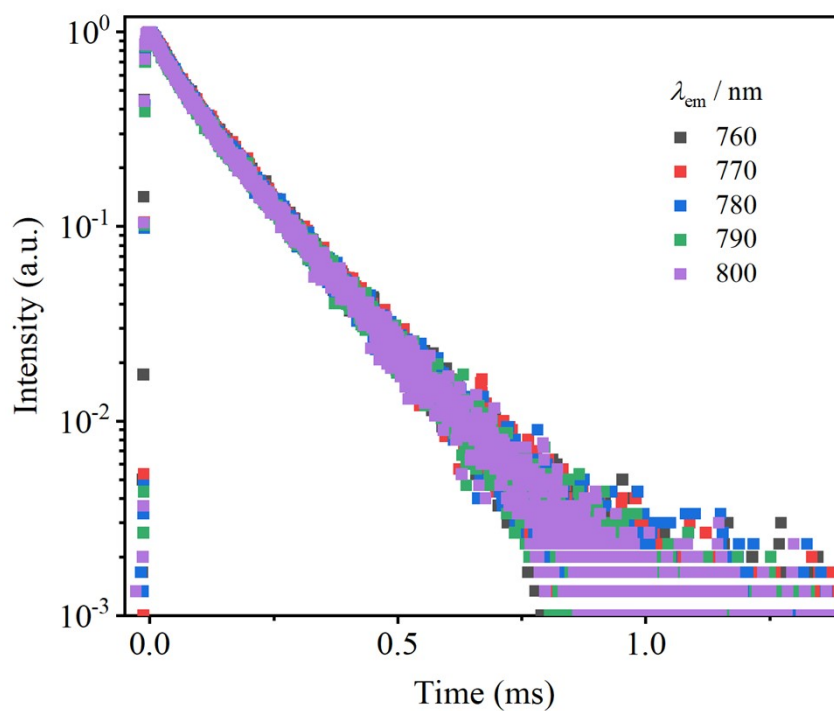


Figure S4. Photoluminescence decay curves of CSSO: Ce³⁺, Cr³⁺, Li⁺ phosphor powders by monitoring the Cr³⁺ emission at different wavelengths under blue light excitation at 450 nm.

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