

Supporting information

VUV-vis photoluminescence, X-ray radioluminescence and energy transfer dynamics of Ce³⁺ and Pr³⁺ doped LiCaBO₃

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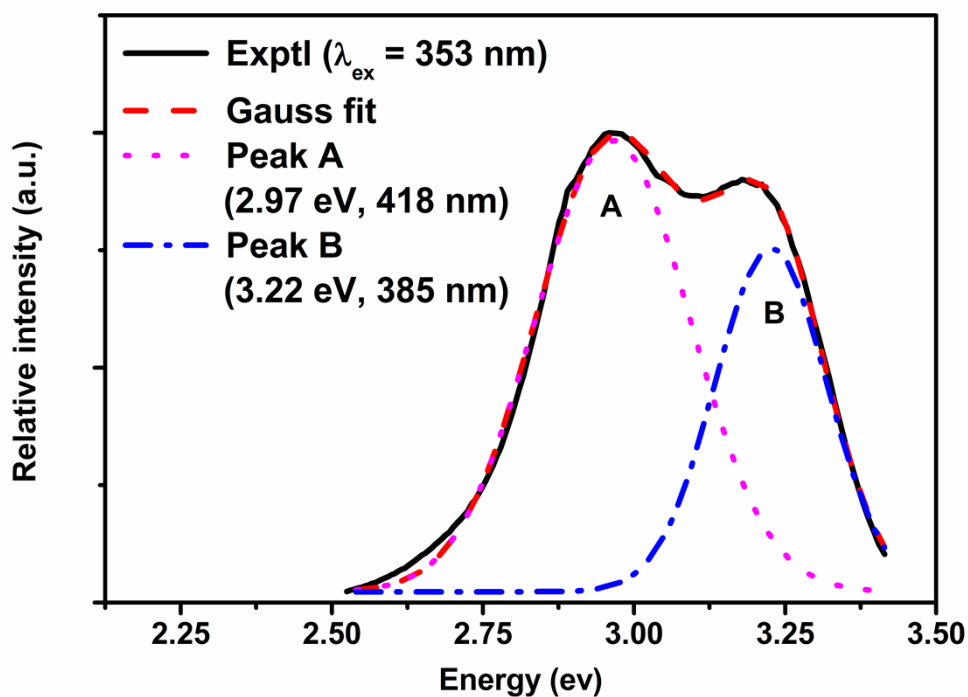


Fig. S1 Fitting results of the emission spectrum ($\lambda_{\text{ex}} = 353 \text{ nm}$) of $\text{Li}_{1.01}\text{Ca}_{0.98}\text{Ce}_{0.01}\text{BO}_3$ at RT using a sum of two Gauss functions.

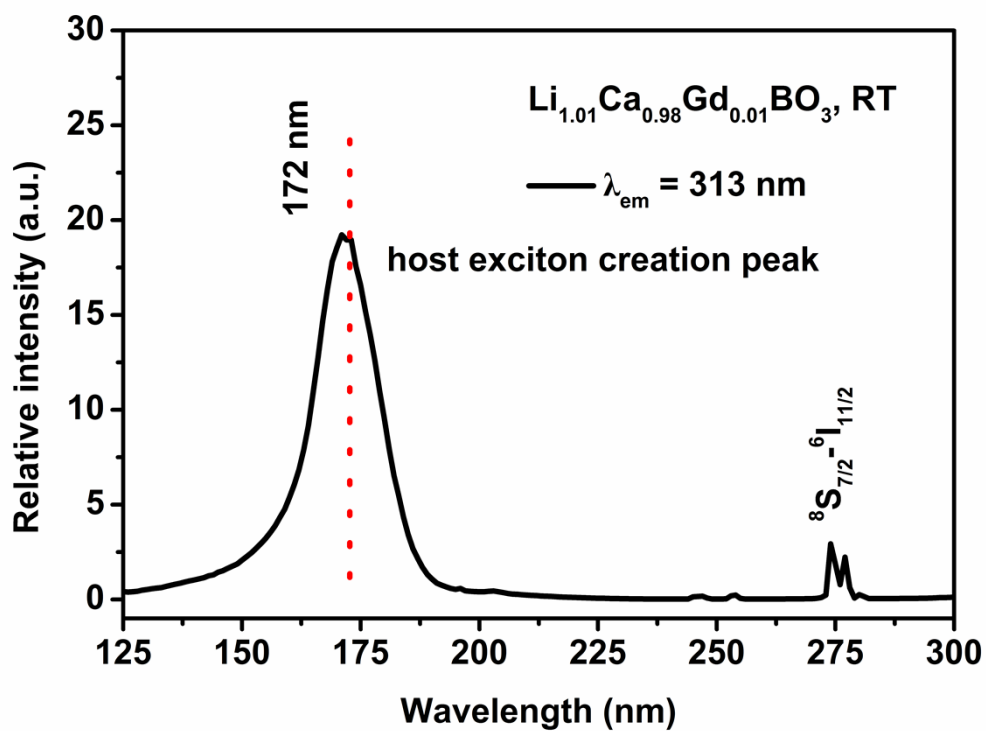


Fig. S2 VUV-UV excitation spectrum ($\lambda_{\text{em}} = 313 \text{ nm}$) of $\text{Li}_{1.01}\text{Ca}_{0.98}\text{Gd}_{0.01}\text{BO}_3$ at RT.

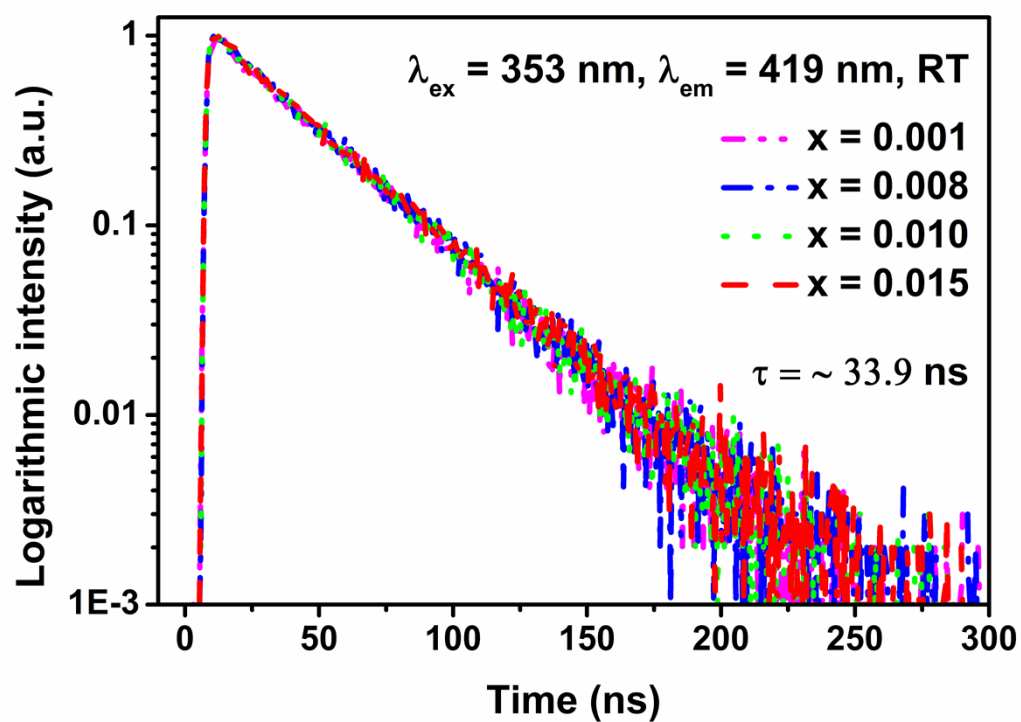


Fig. S3 Normalized luminescence decay curves of $\text{Li}_{1+x}\text{Ca}_{1-2x}\text{Ce}_x\text{BO}_3$ ($x = 0.001, 0.008, 0.010, 0.015$; $\lambda_{ex} = 353 \text{ nm}, \lambda_{em} = 419 \text{ nm}$) at RT.

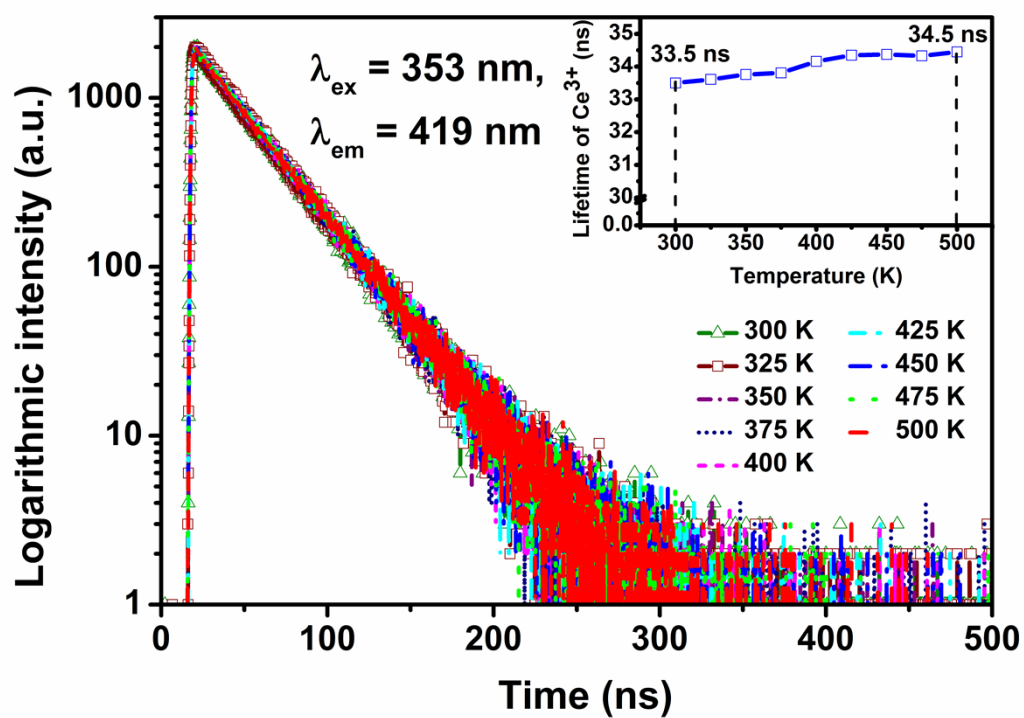


Fig. S4 Normalized luminescence decay curves of $\text{Li}_{1.01}\text{Ca}_{0.98}\text{Ce}_{0.01}\text{BO}_3$ ($\lambda_{\text{ex}} = 353 \text{ nm}$, $\lambda_{\text{em}} = 419 \text{ nm}$) at different temperatures. The inset shows the lifetimes of Ce^{3+} as a function of temperature.

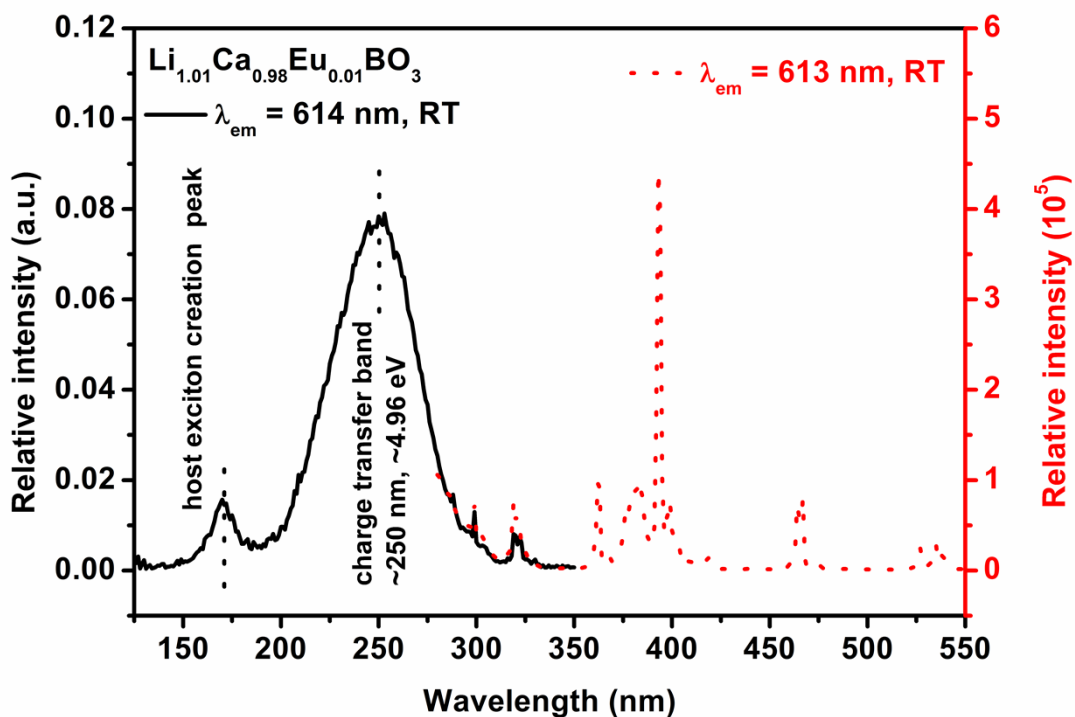


Fig. S5 VUV-UV excitation spectra ($\lambda_{em} = 614, 613$ nm) of $\text{Li}_{1.01}\text{Ca}_{0.98}\text{Eu}_{0.01}\text{BO}_3$ at RT.

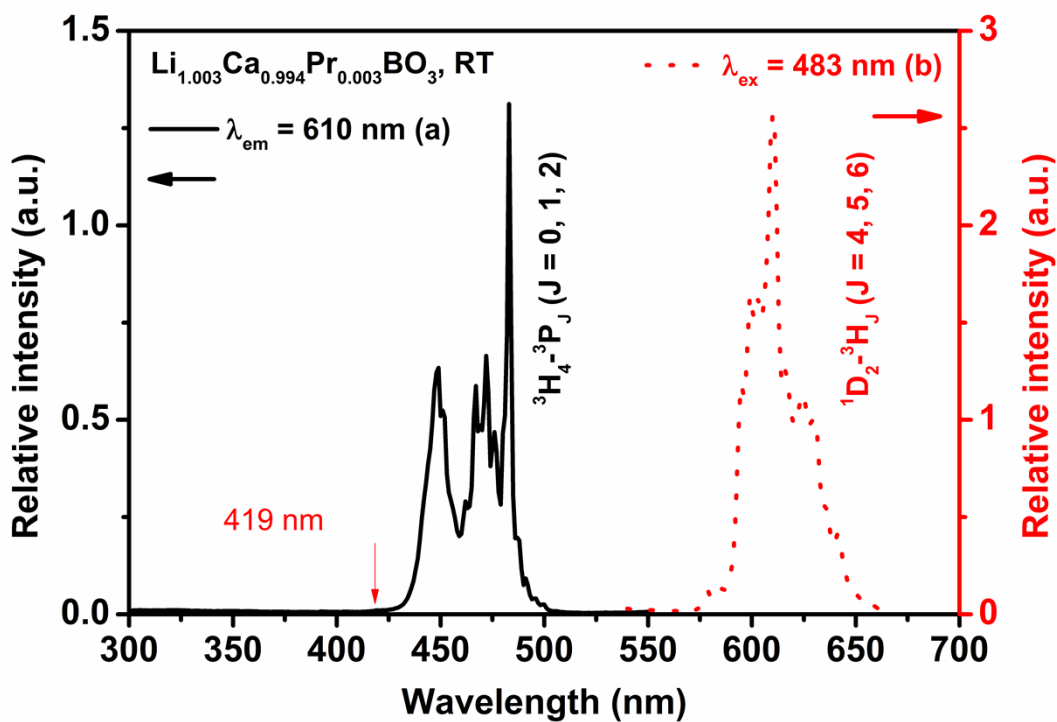


Fig. S6 The 4f-4f excitation spectrum (a, $\lambda_{em} = 610$ nm) and corresponding emission spectrum (b, $\lambda_{ex} = 483$ nm) of $\text{Li}_{1.003}\text{Ca}_{0.994}\text{Pr}_{0.003}\text{BO}_3$ at RT.

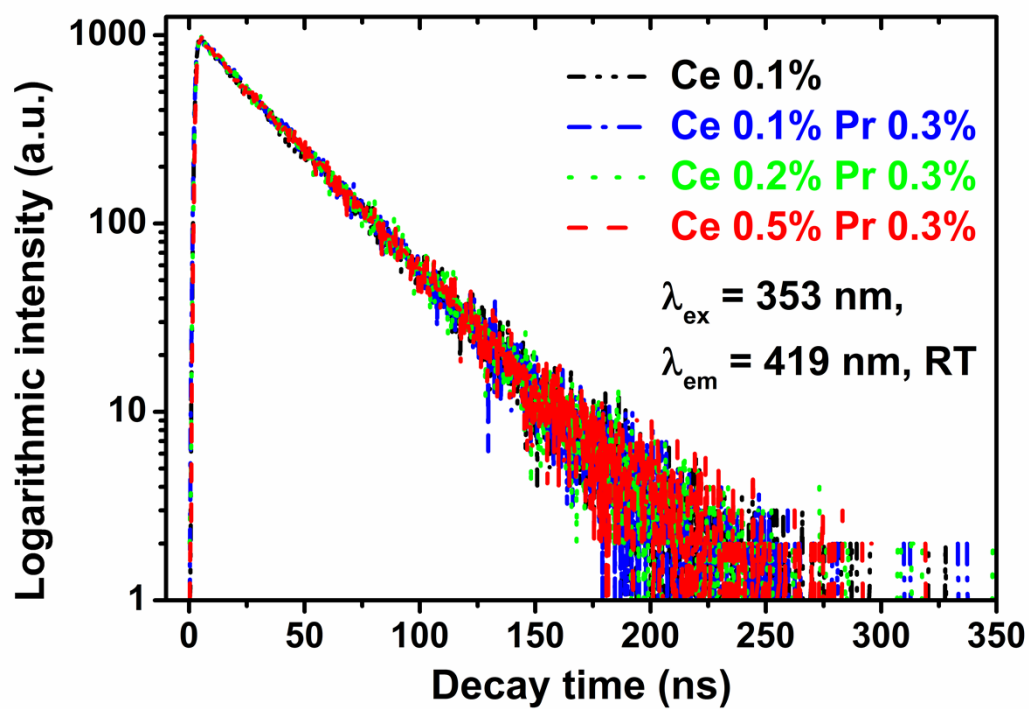


Fig. S7 Luminescence decay curves of Ce^{3+} 5d-4f emission at 419 nm for excitation in 5d state of Ce^{3+} at 353 nm for $\text{Li}_{1.001}\text{Ca}_{0.998}\text{Ce}_{0.001}\text{BO}_3$ and $\text{Li}_{1.003+x}\text{Ca}_{0.994-2x}\text{Ce}_x\text{Pr}_{0.003}\text{BO}_3$ ($x = 0.001, 0.002, 0.005$) at RT.