Supporting info

Probing the local structure of the near-infrared emitting persistent phosphor LiGa$_5$O$_8$:Cr$^{3+}$

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Results: XRD reference patterns

Figure S1: XRD patterns of LGO and LGO:Cr, compared with reference patterns for the P4_32 space group of LiGa_5O_8 (ICSD no. 076-0199, red) and the Pna2_1 space group of LiGaO_2 (ICSD no. 023-0359, black). No LiGaO_2 phase can be detected in the samples.
Figure S2: XRD patterns of LGO:Ge,Cr (x=0.4, x=1), compared with reference patterns for the P4\_32 space group of LiGa\_2O\_5 (ICSD no. 076-0199, red) and the Pna2\_1 space group of LiGaO\_2 (ICSD no. 023-0359, black). No LiGaO\_2 phase can be detected. Small amounts of Ge-containing side phase are present in the x = 1 sample only.
Figure S3: XRD patterns of LGO:Si,Cr (x=0.4 , x = 1), compared with reference patterns for the P4$_3$2$_1$3 space group of LiGa$_5$O$_8$ (ICSD no. 076-0199, red) and the Pna2$_1$ space group of LiGaO$_2$ (ICSD no. 023-0359, black). No LiGaO$_2$ phase can be detected. Small amounts of Si-containing side phase are present in the x = 1 sample only.
Results: SEM-EDX mappings

Figure S4: SEM image of LGO:Cr powder and EDX mappings of Ga (green), Cr (blue) and O (pink) signals and composite map of Ga and Cr.
Figure S5: SEM image of LGO:Ge, Cr (x = 0.4) powder and EDX mappings of Ga (green), Ge (red), Cr (blue) and O (pink) signals and composite map of Ga and Ge.
Figure S6: SEM image of LGO:Ge,Cr (x = 1) powder and EDX mappings of Ga (green), Ge (red), Cr (blue) and O (pink) signals and composite map of Ga and Ge. Clustering of Ge is evident from this composite map.
Figure S7: SEM image of LGO:Si,Cr (x = 0.4) powder and EDX mappings of Ga (green), Si (red), Cr (blue) and O (pink) signals and composite map of Ga and Ge.
Figure S8: SEM image of LGO:Si,Cr (x = 1) powder and EDX mappings of Ga (green), Si (red), Cr (blue) and O (pink) signals and composite map of Ga and Ge. Clustering of Si is evident from this composite map.

NOTE

All SEM images and EDX mappings were taken at a low oxygen pressure of 20 Pa. This results in larger oxygen signals than expected from stoichiometry.
Results: Diffuse reflectance measurements

Figure S9: Diffuse reflectance spectra of undoped LGO and selected LGO:Cr samples. The optical transitions of Cr$^{3+}$ are visible below 300 nm, and at 410 and 600 nm. The noise between 800 and 900 nm is due to the changing of detectors in the spectrometer.
Results: Radioluminescence

**Figure S10:** Integrated emission intensity as a function of time, during X-Ray irradiation of LGO:Cr. The emission intensity does only decrease 2% over the course of 3 h. Inset: emission spectrum of LGO:Cr, when excited via full spectrum Cu-anode X-rays.