Supporting information

**Topological tailoring of structure and defects to enhance red to near-infrared afterglow from Mn$^{2+}$-doped germanate photonic glasses**

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![Graph](image1.png)

**Fig. S1** Afterglow decay curves of samples GAM ($M = \text{Mg, Ca, Sr, Ba}$).

![Graph](image2.png)

**Fig. S2** (a) Raman spectra and (b) FTIR spectra and (c) $^{27}$Al 1D MAS NMR spectra (400 MHz) of samples GAM ($M = \text{Mg, Ca, Sr, Ba}$).
Fig. S3 EPR spectra of samples \( \text{GAM} (M = \text{Mg, Ca, Sr, Ba}) \).

Fig. S4 (a) UV-vis transmission spectra of the \( \text{GAM} (M = \text{Mg, Ca, Sr, Ba}) \) samples; inset is the plots of \((\alpha h\nu)^2\) vs. \(h\nu\) demonstrated direct optical band gap \((E_g)\). (b) Dependence curves of the optical basicity and optical band gap on different alkaline-earth metals.

Fig. S5 (a) Emission \((\lambda_{ex} = 254 \text{ nm})\) and (b) excitation \((\lambda_{em} = 650 \text{ nm})\) spectra of the \( \text{GAM} (M = \text{Mg, Ca, Sr, Ba}) \) samples. (c) Luminescence decay curves for samples \( \text{GAM} (\lambda_{ex} = 254 \text{ nm}, \lambda_{em} = 650 \text{ nm}) \), the inset shows the dependence of lifetime on different alkaline-earth metals.