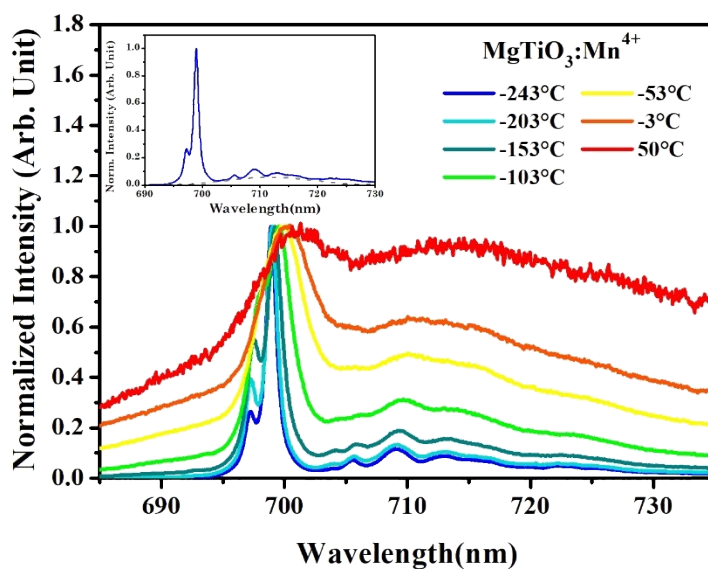


Electronic Supplementary Information (ESI)

ESI-1 Emission spectra of $\text{MgTiO}_3:\text{Mn}^{4+}$ from $-243\text{ }^\circ\text{C}$ to $50\text{ }^\circ\text{C}$. On all this temperature range it is possible to use the I_{709}/I_{700} ratio to measure temperature. At higher temperature in the same experimental conditions, the signal is no more usable. The inset present the ${}^4\text{T}_2 \rightarrow {}^4\text{A}_2$



deconvolution at low temperature.

ESI-2 Lifetimes obtained with the increasing temperature are presented in red, the blue lifetimes correspond to back to start. No change were observed between the increasing step and the decreasing step, which confirm i) the reversibility of the system ii) that no dehydration effect is observed.

