Fig. S1 Structure and Rietveld refinement results of CAG:xCr^{3+} with (a) x=2%, (b) x=4%, (c) x=6% and (d) x=7%

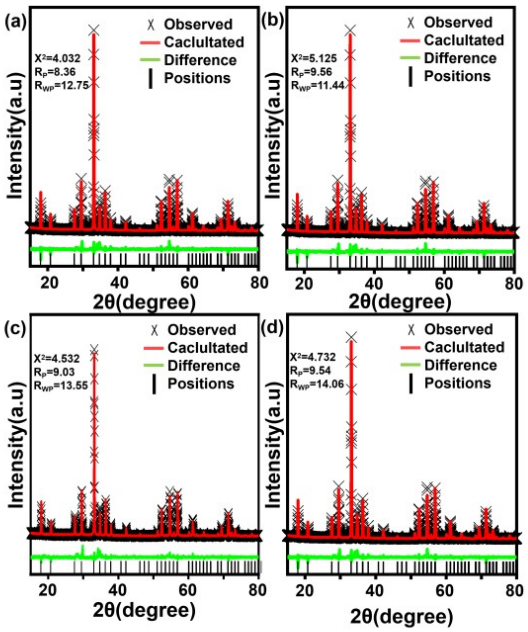

Fig. S2 The excitation spectra of CAG:xCr^{3+} (λ_{em}=722 nm) (**Response to Reviewer 1 's question 1**).

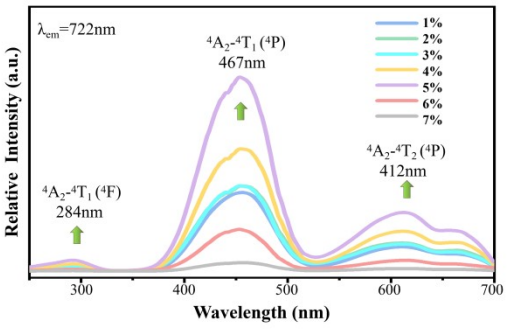

Fig. S3 The emission spectra of CAG:xCr^{3+} (λ_{ex}=467 nm). +

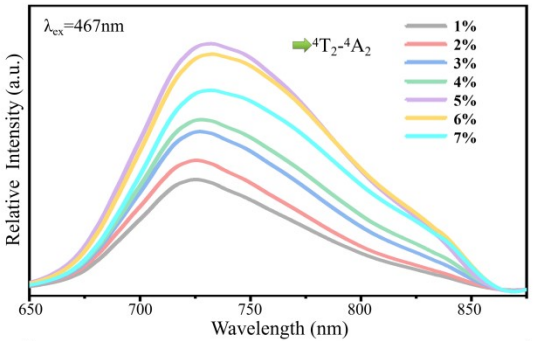

Fig. S4 The emission spectra of CAG:2%Cr^{3+} at 4K and 300K.

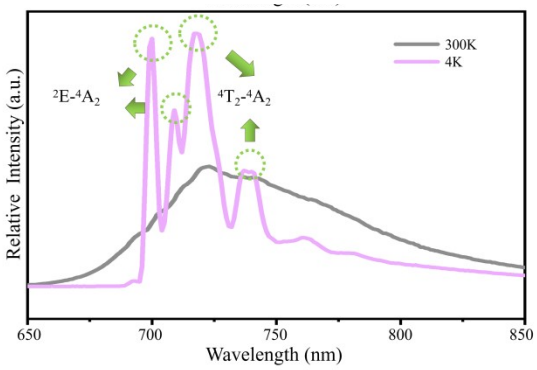

Fig. S5 The lifetime decay curves of CAG: 2%Cr^{3+}monitoring the emission at 700 nm, 709 nm, 728 nm and 743 nm respectively under the excitation of 480 nm. (**Response to Reviewer 3 's question 6**)

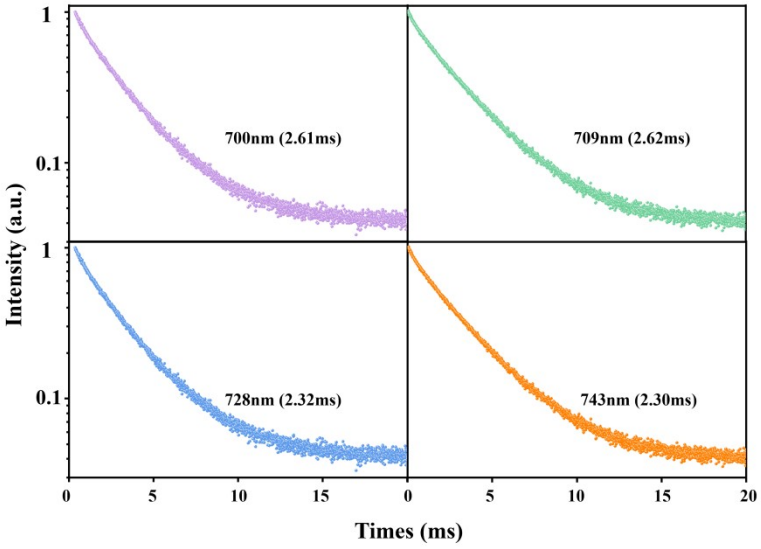

Fig. S6 Long persistent luminescence (LPL) spectra of CAG:$x$$Cr^{3+}$ (x=1%-7%).

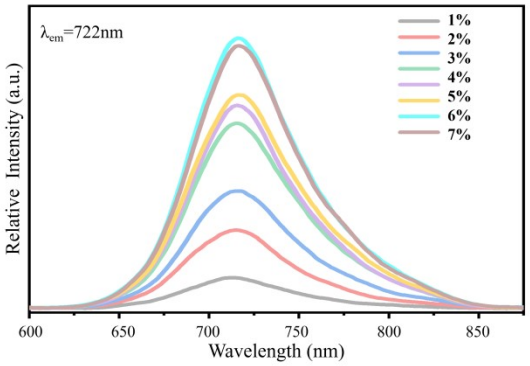

Fig. S7 Comparison with a typical phosphor ($SrAl_2O_4$:Eu,Dy, $Sr_2MgSi_2O_7$:Eu,Dy, $Sr_{0.7}Ca_{0.25}S$:Eu) showing persistent luminescence comparison of emission and emission spectra, e.g., after 30s. (**Response to Reviewer 3 's question 1**)

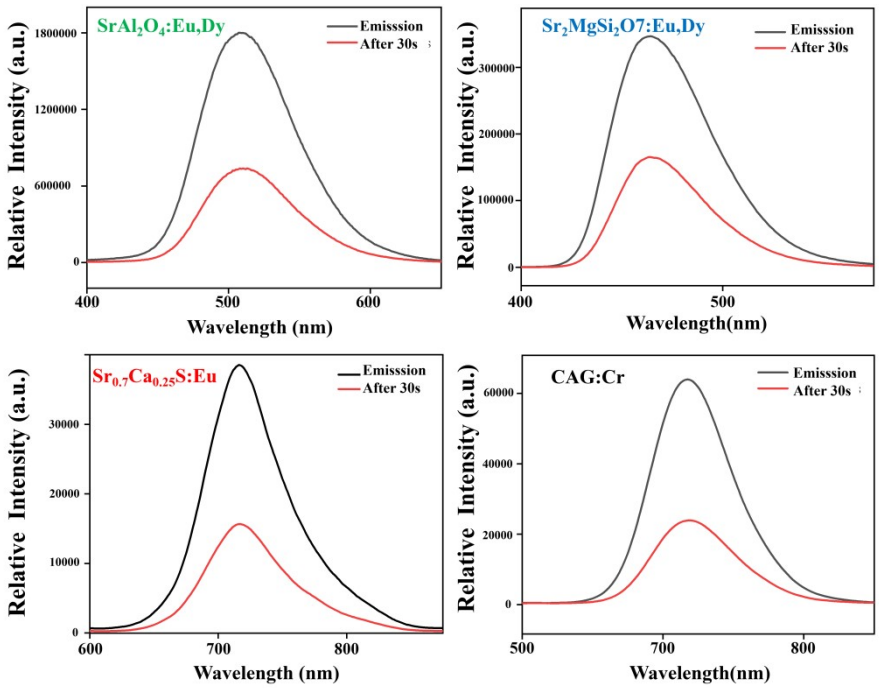

Fig. S8 Afterglow intensity of CAG:xCr^{3+} (x = 2%, 6%) under UV radiation after 5 min as a function of time. (**Response to Reviewer 3 's question 1**)

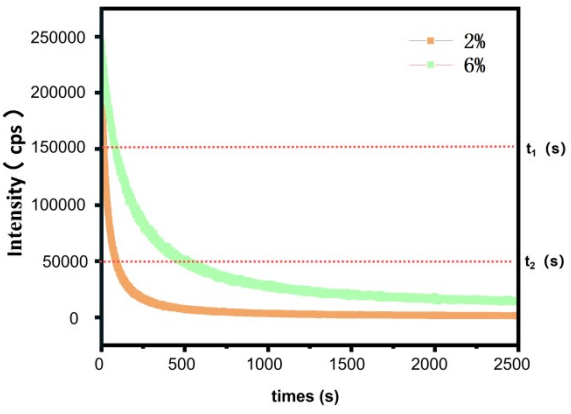

Fig. S9 Calculated and analytical results for the band gap of CAG: xCr^{3+} (x = 3% to 7%).

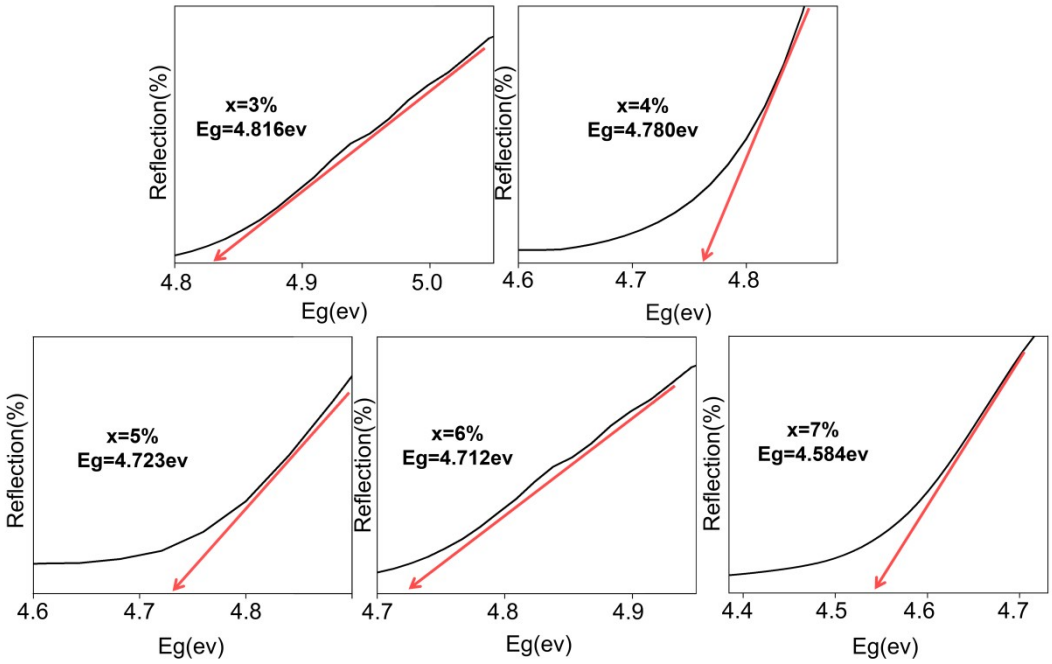

Table S1 CAG:xCr^{3+} decay time parameters 1 and 2 and the corresponding standard deviation.

	concentration	**τ_1 (s)**	**Standard Deviation**	**τ_2 (s)**	**Standard Deviation**
$Ca_3Al_2Ge_3O_{12}$:xCr^{3+}	x=1%	16.92618	0.03693	114.24682	0.34807
	x=2%	17.70529	0.03676	126.62225	0.33975
	x=3%	16.15579	0.02412	109.75118	0.219
	x=4%	14.2773	0.01843	99.24778	0.16131
	x=5%	13.24918	0.06506	87.05239	0.50453
	x=6%	12.09573	0.05147	63.96253	0.39145
	x=7%	10.63198	0.04842	59.28366	0.36929

Table S2 Comparison table with commercial powder attenuation difference.

Samples	Emission Peak Intensity(a.u.)	After 30s Emission Peak Intensity(a.u.)	Decay multiplier
$SrAl_2O_4$:Eu,Dy	1800530	733571	2.454
$Sr_2MgSi_2O_7$:Eu,Dy	3121190	1484710	2.102
$Sr_{0.7}Ca_{0.25}S$:Eu	38347	14329	2.676
$Ca_3Al_2Ge_3O_{12}$:2%Cr^3	70700	29438	2.231