

## Electronic Supplementary Information

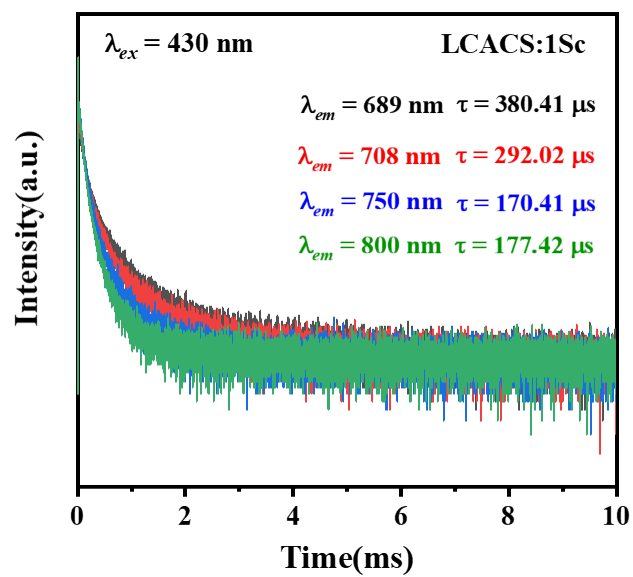
Thermal stability and quantum efficiency improvement  
of Cr<sup>3+</sup>-activated garnet phosphors via regulating A/B  
sites for near-infrared LED applications

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*Yue Guo*<sup>a,b\*</sup>, *Ling Li*<sup>b,\*</sup>, *Dawei Wen*<sup>a,\*</sup>

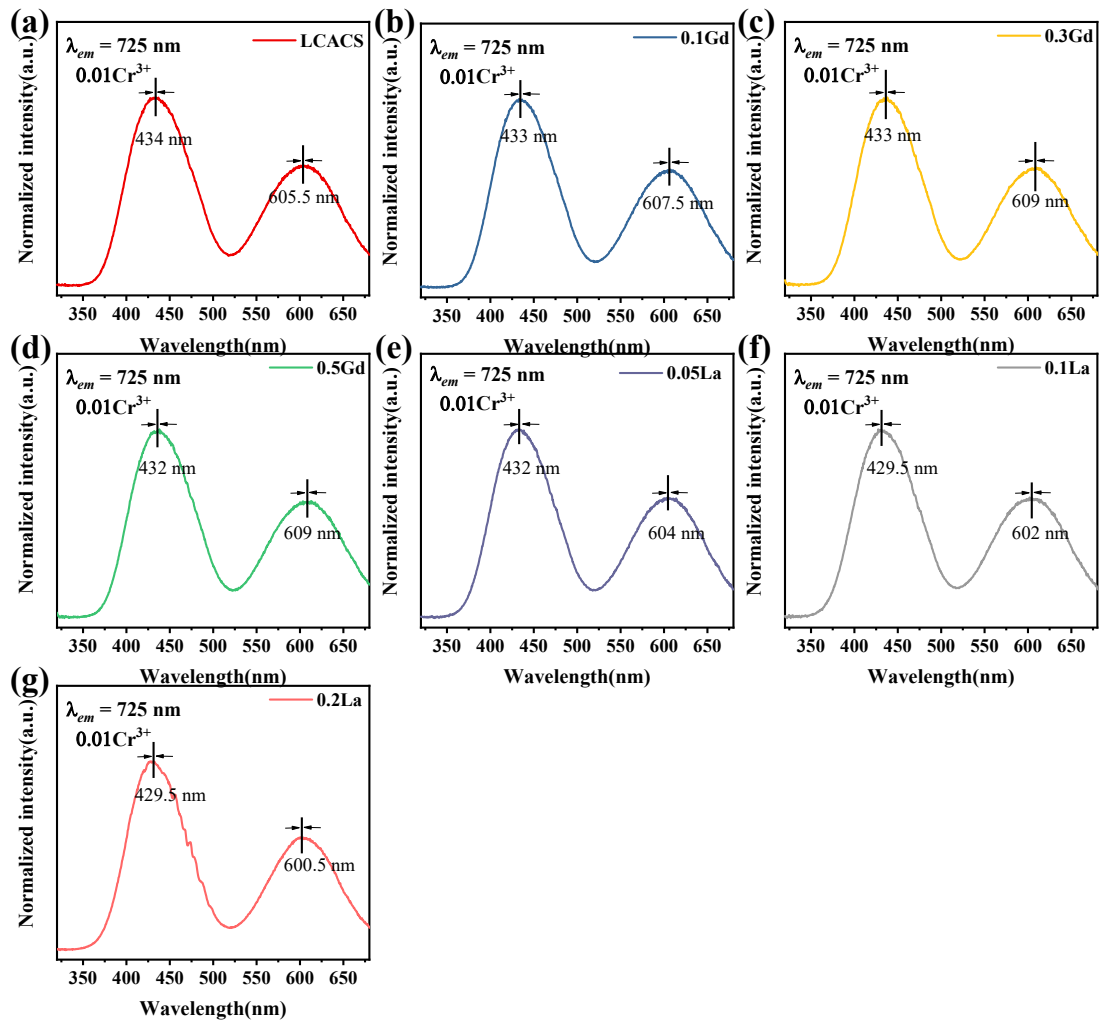
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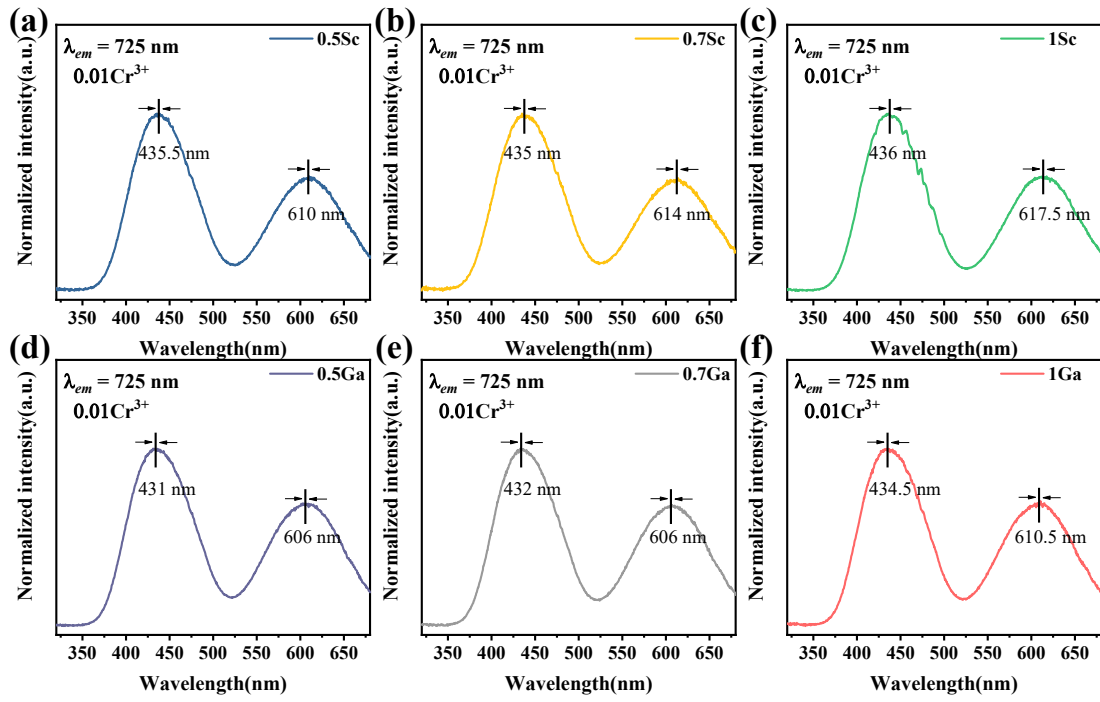
Email: [guoyuewyu@163.com](mailto:guoyuewyu@163.com), [liling402431@hotmail.com](mailto:liling402431@hotmail.com), [ontaii@163.com](mailto:ontaii@163.com)



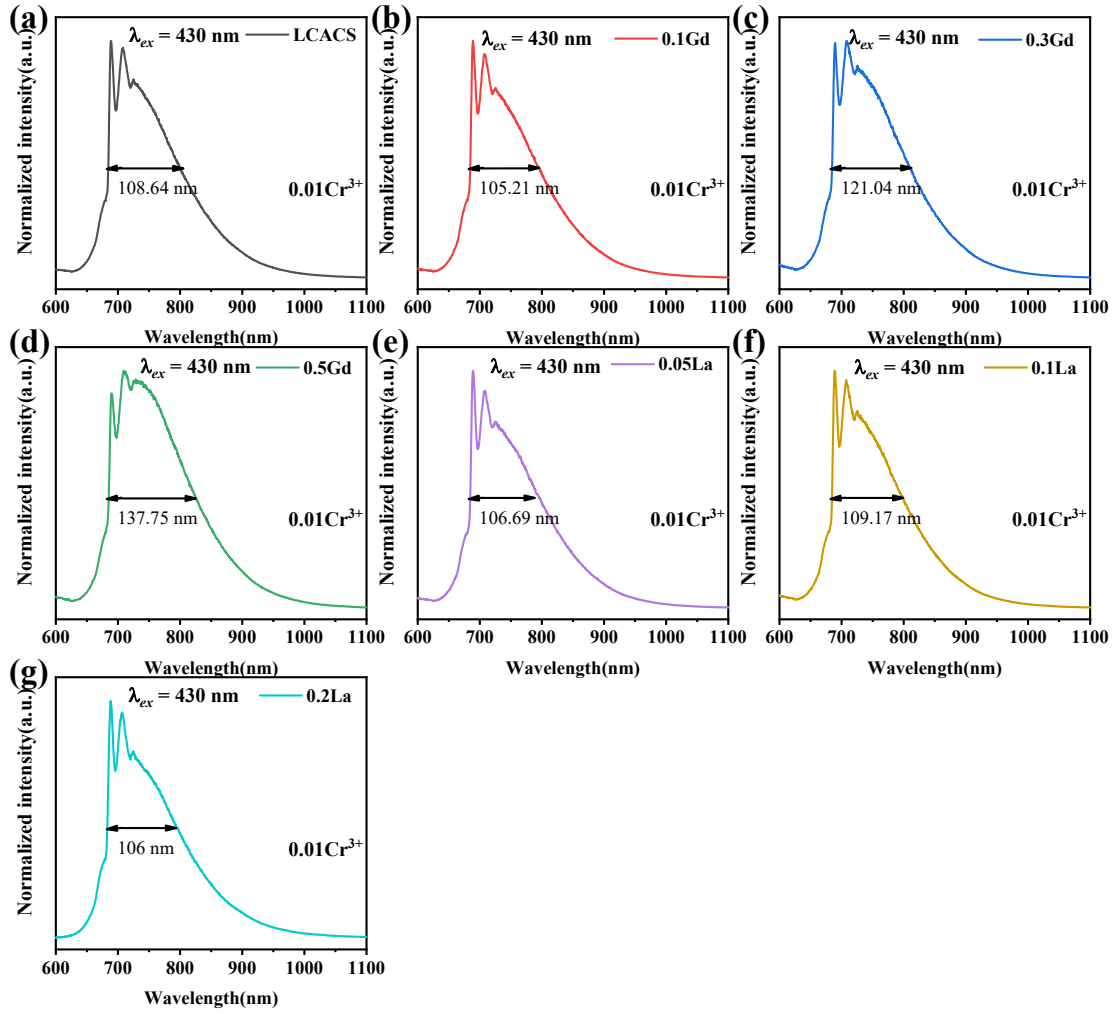
**Fig. S1** Lifetimes of LCACS: 1Sc phosphor at 689 nm, 708 nm, 750 nm and 800 nm under 430 nm excitation.



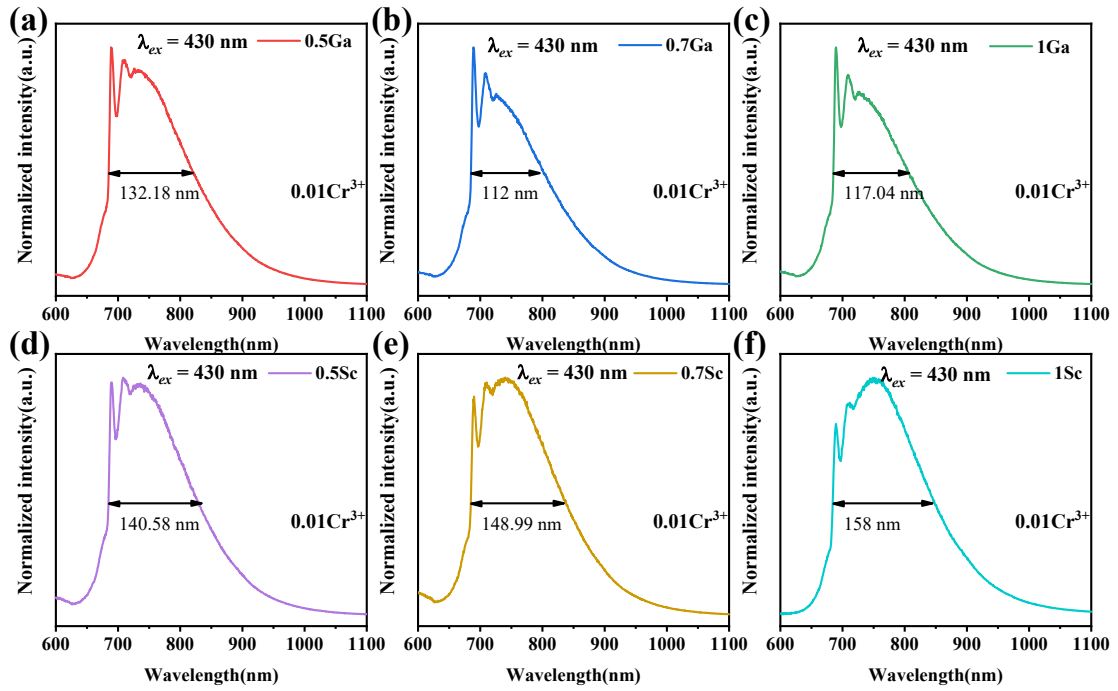
**Fig. S2** Detail spectral shift value of PLE spectra in A-lattice substitution LCACS:  $x\text{Gd/La}$  ( $x = 0.05\text{-}0.5$ ) phosphors.



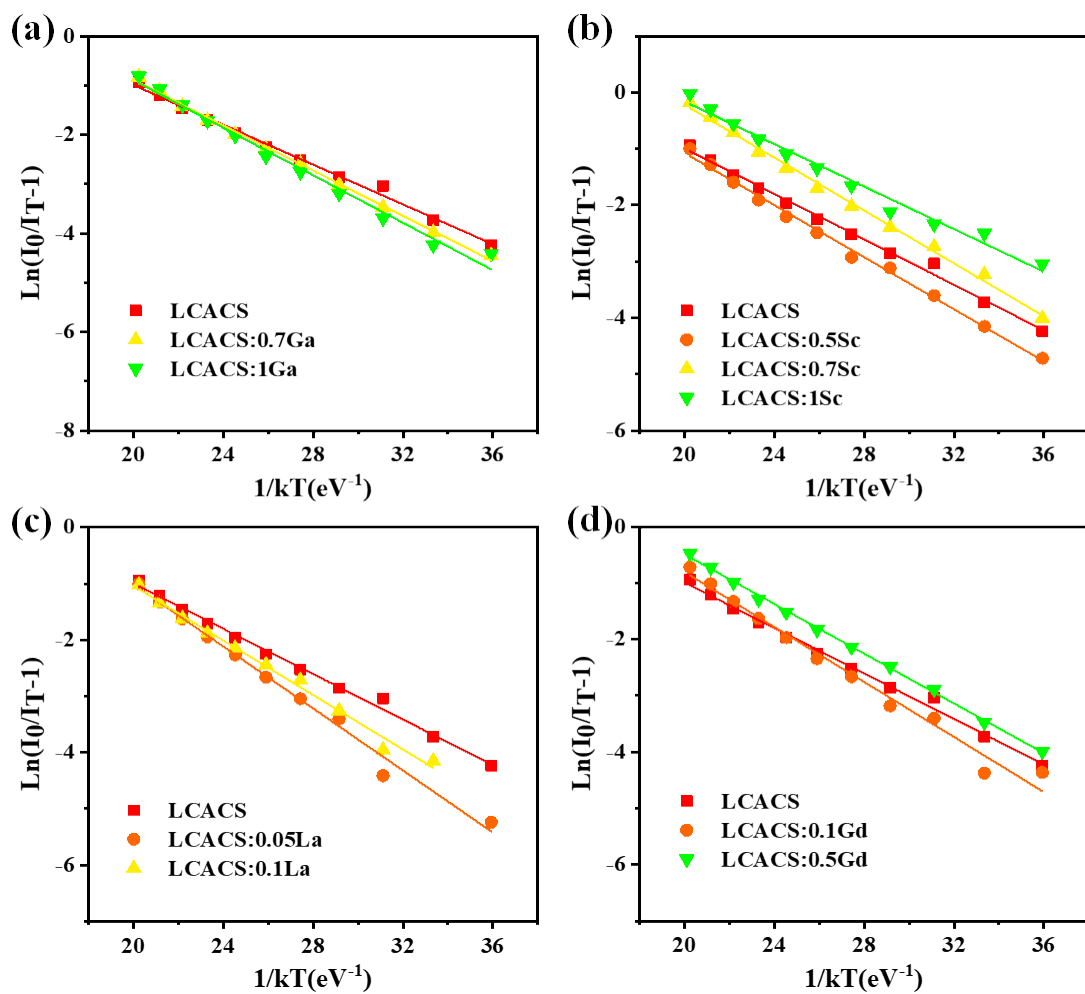
**Fig. S3** Detail spectral shift value of PLE spectra in B-lattice substitution LCACS:  $y\text{Ga}/\text{Sc}$  ( $y = 0.5-1$ ) phosphors.



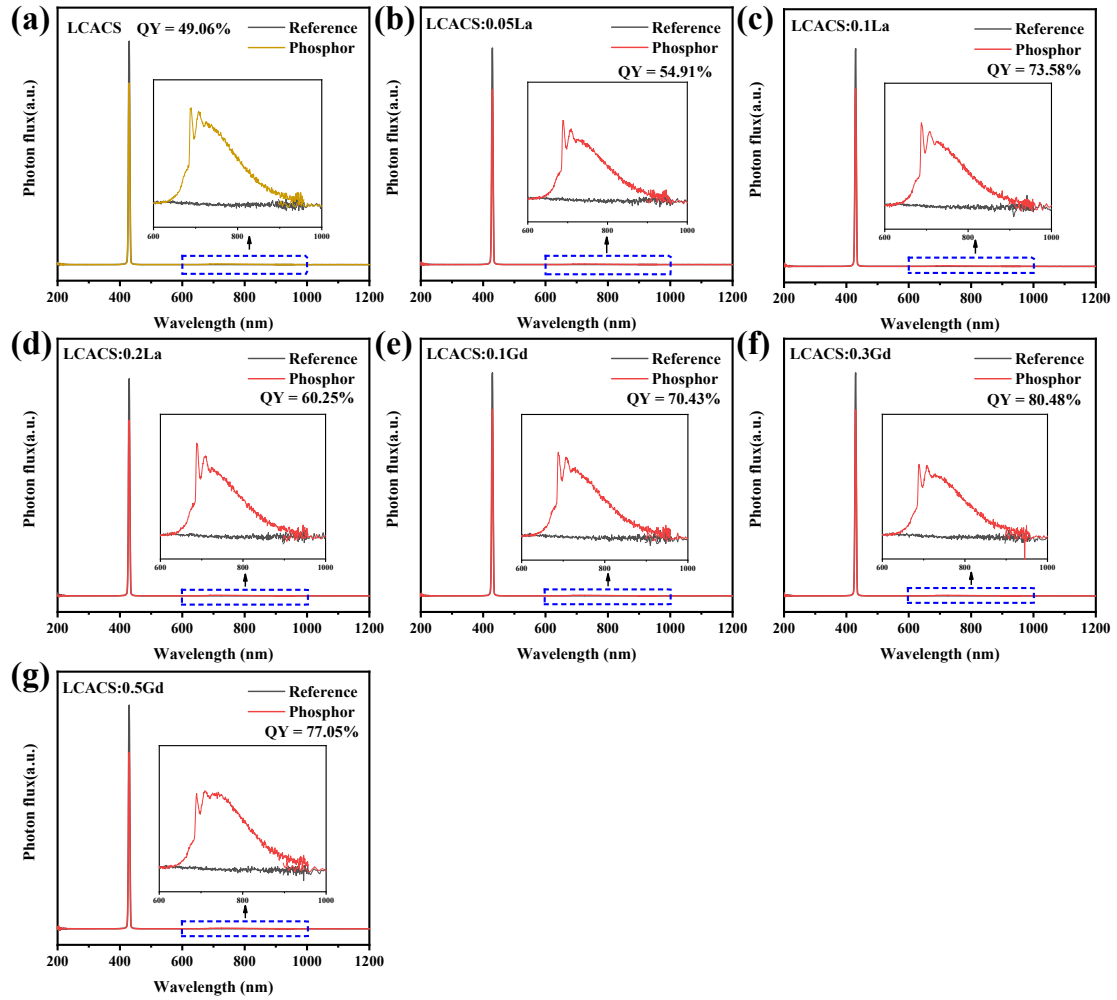
**Fig. S4** The FWHM value of broadband in A-lattice substitution LCACS:  $x\text{Gd/La}$  ( $x = 0.05-0.5$ ) phosphors.



**Fig. S5** The FWHM value of broadband in B-lattice substitution LCACS:  $y$ Ga/Sc ( $y = 0.5-1$ ) phosphors.

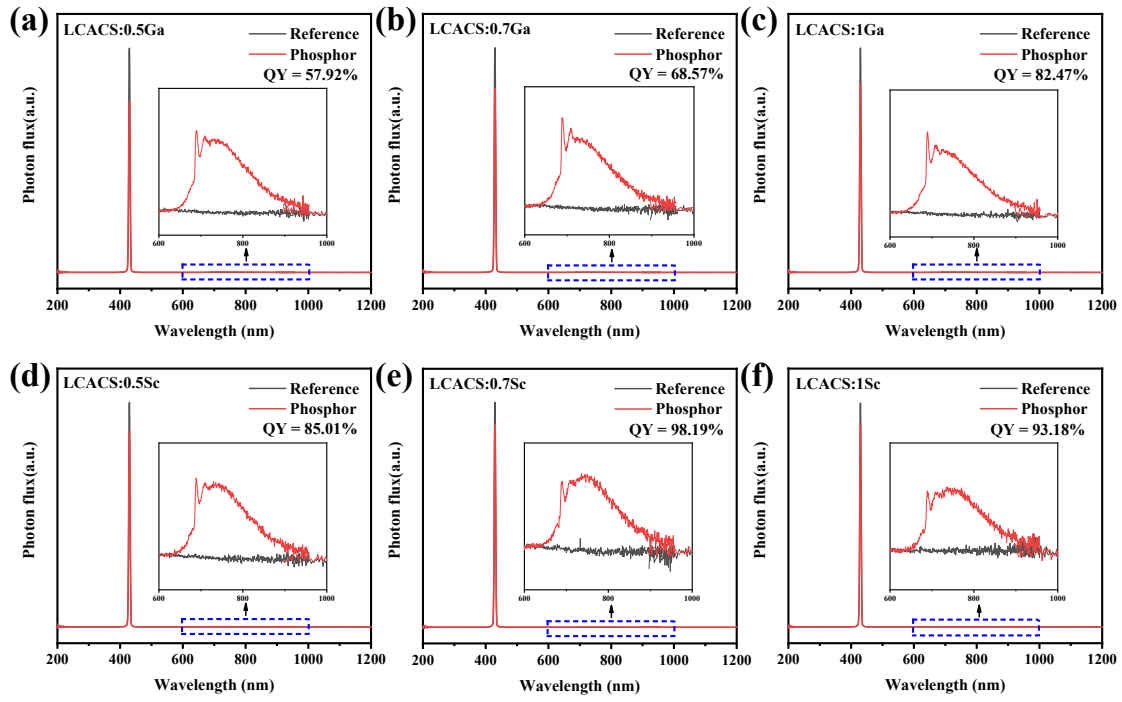


**Fig. S6** Activation energy plots using the modified Arrhenius equation for LCACS:  $x\text{Gd/La}$  ( $x = 0.05-0.5$ ) and LCACS:  $y\text{Ga/Sc}$  ( $y = 0.5-1$ ) phosphors.



**Fig. S7** The IQE Spectra graph of the test in A-lattice substitution LCACS:  $x$ Gd/La ( $x = 0.05-0.5$ ) phosphors.





**Fig. S8** The IQE Spectra graph of the test in B-lattice substitution LCACS:  $y$ Ga/Sc ( $y = 0.5-1$ ) phosphors.

**Table S1** Specific activation energy parameters for LCACS:  $x\text{Gd/La}$  ( $x = 0.05\text{-}0.5$ ) and LCACS:  $y\text{Ga/Sc}$  ( $y = 0.5\text{-}1$ ) phosphors.

<b>Phosphor</b>	<b><math>\Delta E</math> (eV)</b>	<b><math>R^2</math></b>	<b>Phosphor</b>	<b><math>\Delta E</math> (eV)</b>	<b><math>R^2</math></b>
<b>LCACS</b>	0.202	0.993			
<b>LCACS: 0.05La</b>	0.276	0.989	<b>LCACS: 0.5Ga</b>	—	—
<b>LCACS: 0.1La</b>	0.243	0.990	<b>LCACS: 0.7Ga</b>	0.230	0.997
<b>LCACS: 0.2La</b>	—	—	<b>LCACS: 1Ga</b>	0.241	0.986
<b>LCACS: 0.1Gd</b>	0.244	0.981	<b>LCACS: 0.5Sc</b>	0.231	0.995
<b>LCACS: 0.3Gd</b>	—	—	<b>LCACS: 0.7Sc</b>	0.235	0.995
<b>LCACS: 0.5Gd</b>	0.221	0.998	<b>LCACS: 1Sc</b>	0.189	0.980