Electronic Supplementary Information (ESI);

Near Ultraviolet Light Excitable Highly Efficient Blue-Green Multicolour Warwickite Phosphor, $ScCaO(BO_3):Ce^{3+}, Tb^{3+}$

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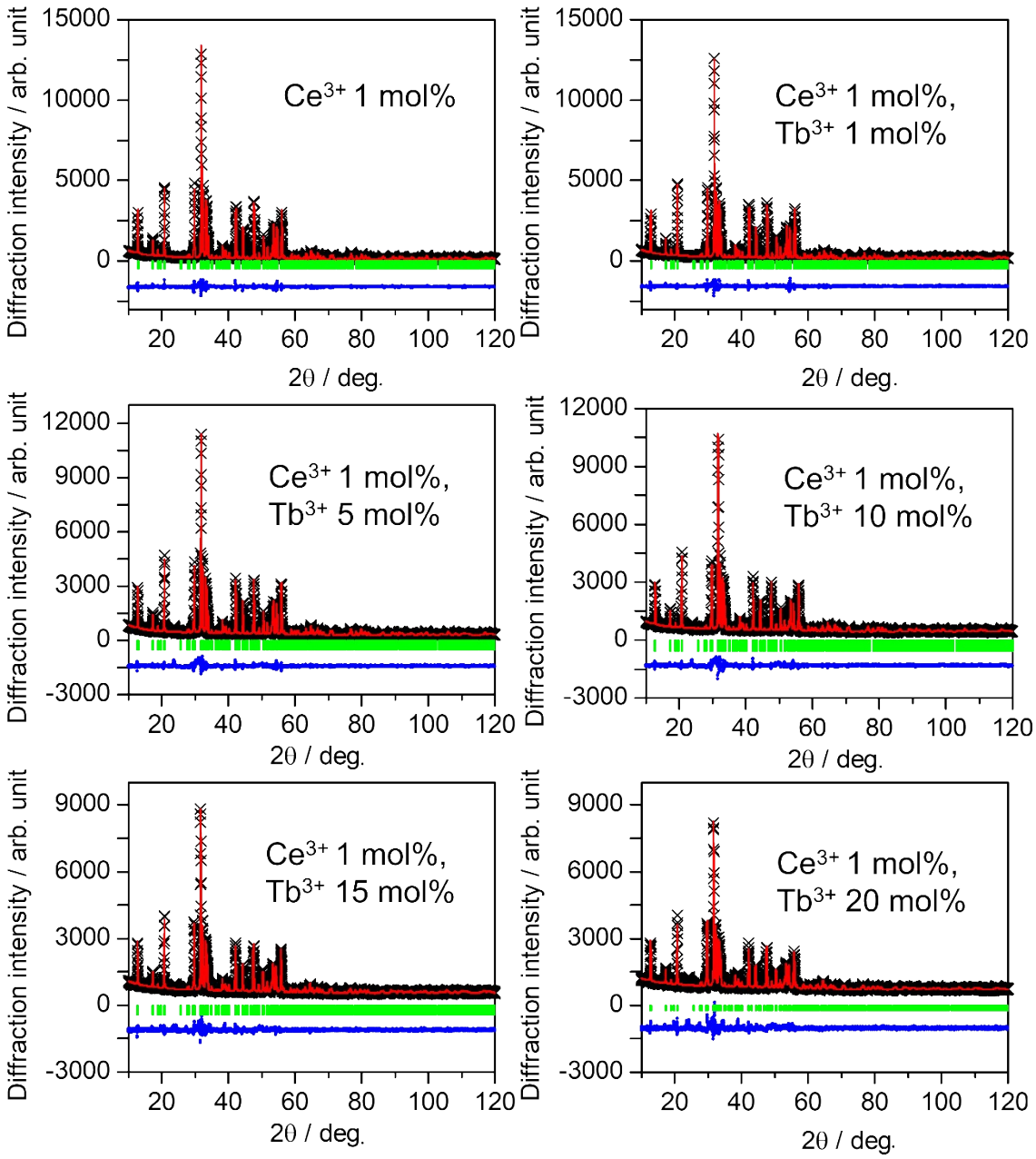

Figure S1 Rietveld refinement for $ScCaO(BO_3)$:0.01Ce^{3+}, yTb^{3+} (y = 0, 0.01, 0.50, 0.10, 0.15 and 0.20). Observed (black cross symbol) and calculated (red) and difference (blue) were obtained from Rietveld refinement on X-ray powder diffraction of samples.

Table S1 Lattice parameters and R-values obtained from the Rietveld refinement for $ScCaO(BO_3):0.01Ce^{3+}$, yTb^{3+} (y = 0, 0.01, 0.05, 0.10, 0.15, 0.20).

$CaScO(BO_3):0.01Ce^{3+}$, yTb^{3+}						
	y = 0	y = 0.01	y = 0.05	y = 0.10	y = 0.15	y = 0.20
System	Orthorhombic					
S. G.※	*Pnma* (No. 62)					
a [Å]	10.2601(3)	10.2690(3)	10.2702(6)	10.2740(6)	10.2754(7)	10.276(1)
b [Å]	3.36513(9)	3.3664(1)	3.3694(2)	3.3783(2)	3.3826(2)	3.3856(3)
c [Å]	9.4174(3)	9.4187(3)	9.4199(5)	9.4298(5)	9.4313(6)	9.4334(9)
V [Å^3]	325.15(2)	325.60(2)	325.97(3)	327.29(3)	327.81(4)	328.18
Z [-]	4					
R_{wp} [%]	9.408	8.415	8.551	6.811	6.100	6.432
R_p [%]	6.832	6.203	5.865	4.753	4.357	4.412
R_e [%]	5.624	5.286	4.449	3.930	3.661	3.309
S [-]	1.6726	1.592	1.9221	1.733	1.666	1.944

※S. G. means Space Group

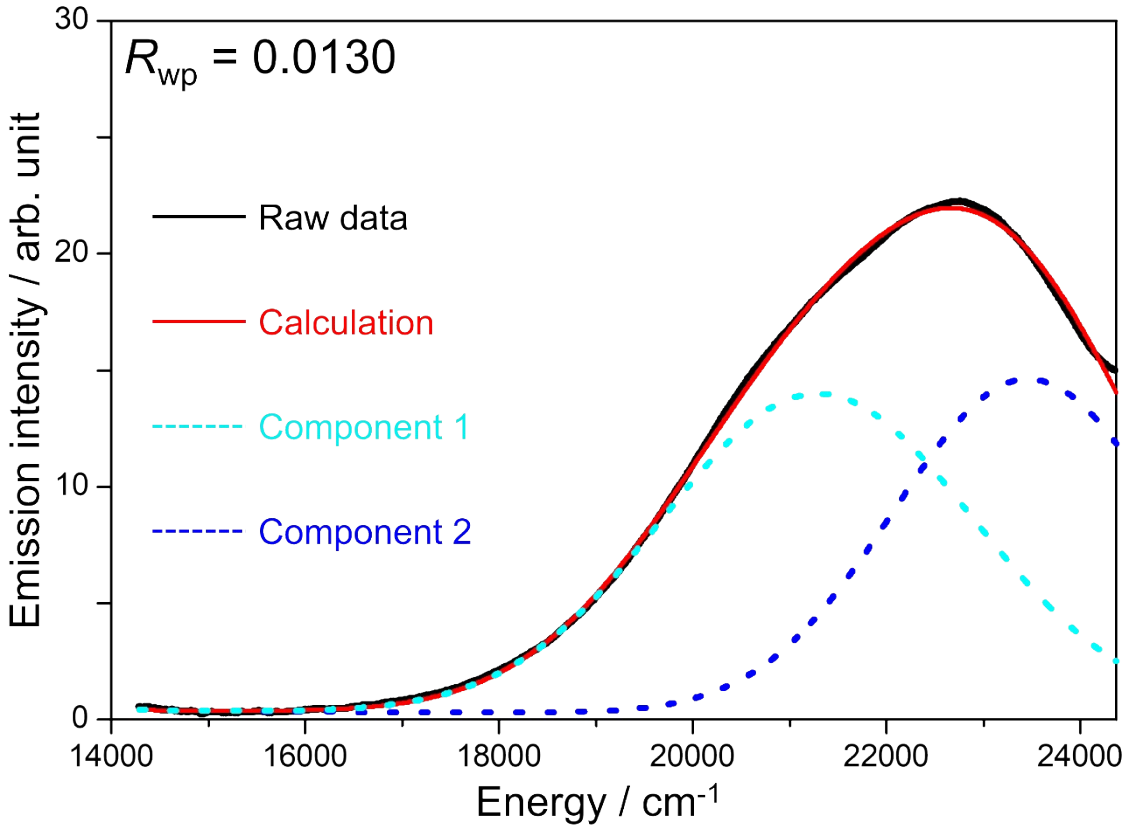

Figure S2 Peak deconvolution of the emission band for 1 mol% Ce^{3+}-activated SCBO phosphor with two components.

Table S2 Results of the peak deconvolution in $ScCaO(BO_3):0.01Ce^{3+}$.

Component 1 [cm^{-1}]	Component 2 [cm^{-1}]	Energy gap [cm^{-1}]
21,290	23,459	2,169

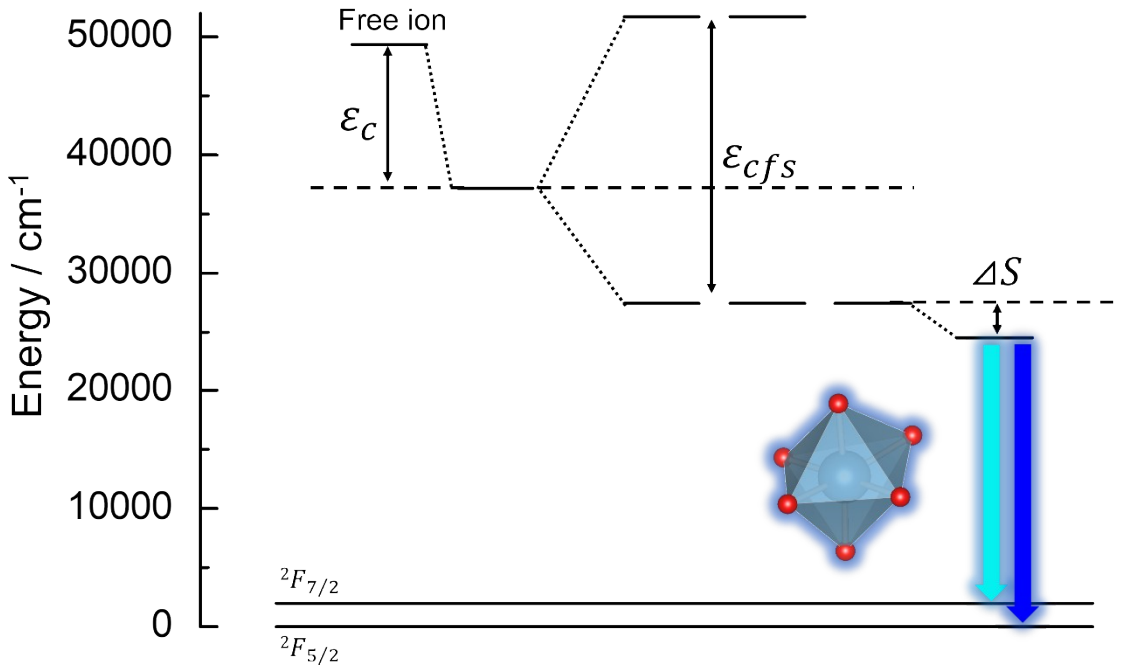

Figure S3 Optical energy diagram of the Ce^{3+} ion occupied on CaO_6 octahedral sites in the SCBO host. ε_c, ε_{cfs} and ΔS represent centroid shift, crystal field splitting and stokes shift, respectively.

Table S3 Results of Absolute quantum efficiencies measuremnt for $ScCaO(BO_3):0.01Ce^{3+}$ and $CaScO(BO_3):0.01Ce^{3+}$, $0.15Tb^{3+}$ phosphors.

Sample	Abs. [%]	EQE [%]	IQE [%]
$0.01Ce^{3+}$	23.685	20.053	84.666
$0.01Ce^{3+}$,0.15 Tb^{3+}	27.065	16.801	62.076

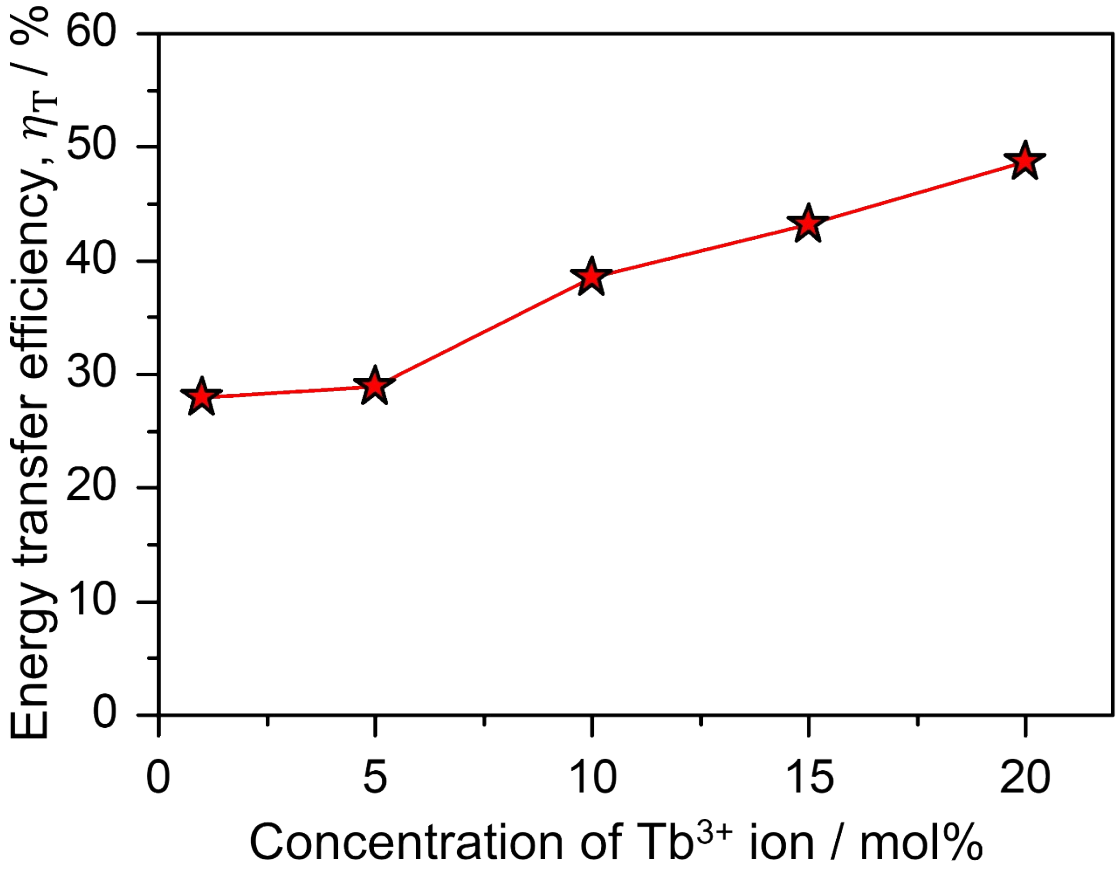

Figure S4 Dependence of Energy transfer efficiency on concentration of Tb^{3+} ion.