Supporting information

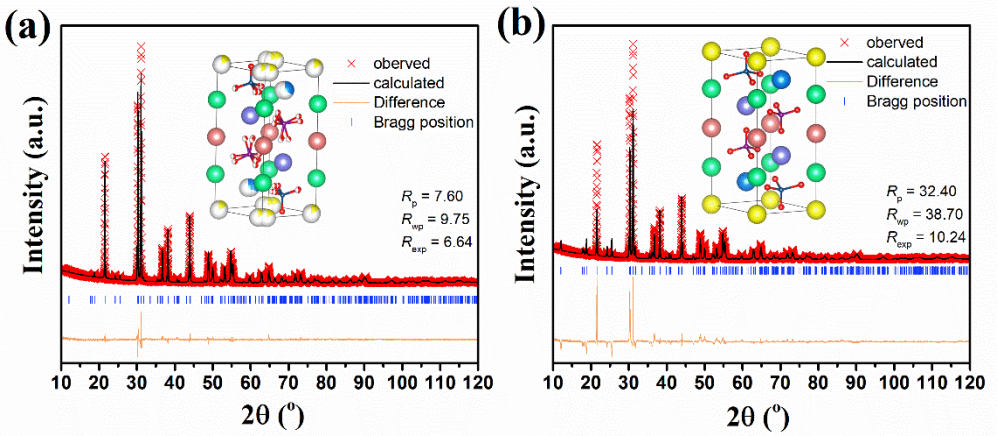

Figure S1 The Rietveld refinement results of *T*-phase $(Ba_{0.65}Ca_{0.35})_2SiO_4$ for the split-atom-site model (a) and unsplit-atom-site model (b), respectively. The observed (crosses), calculated profiles (full curve), the difference between the observed and calculated data and expected positions (blue vertical bars) are plotted, respectively.

Table S1 The refined structural parameters of *T*-phase $(Ba_{0.65}Ca_{0.35})_2SiO_4$ for the split-atom-site model.

Atoms	Wyckoff position	*x*	*y*	*z*	*Occ*
Ba1	6*i*	0.6515(8)	-0.6515(8)	0.1624(2)	0.1097(8)
Ca1	6*i*	0.6515(8)	-0.6515(8)	0.1624(2)	0.0567(2)
Ba2	6*g*	0.0874(6)	0	0	0.0712(5)
Ca2	6*g*	0.0874(6)	0	0	0.0121(1)
Ba3	2*d*	1/3	2/3	0.3441(1)	0.1649(1)
Ca3	2*d*	1/3	2/3	0.3441(1)	0.0017(5)
Ba4	2*c*	0	0	0.2402(3)	0.0039(9)
Ca4	2*c*	0	0	0.2402(3)	0.1611(9)
Ba5	1*b*	0	0	1/2	0.0848(1)
Si1	2*d*	1/3	2/3	0.1257(1)	0.1667(1)
Si2	2*d*	1/3	2/3	0.6074(7)	0.1666(8)
O1	12*j*	0.1511(8)	0.3871(1)	0.1666(4)	0.4998(9)
O2	6*i*	0.7278(5)	-0.7278(5)	0.5017(1)	0.1666(5)
O31	6*i*	0.8036(5)	-0.8036(5)	0.3377(1)	0.2497(8)
O32	6*i*	0.8171(1)	-0.8171(1)	0.3704(8)	0.2509(1)

O4	2*d*	1	1/3	2/3	-0.0019(1)	0.1666(7)

Table S2 The average Ba/Ca/Eu-O bond-lengths (Å) with different coordination number in some common Barium/Calcium/Europium-silicate compounds. The shortest and longest bond-lengths (Å) in the coordination polyhedrons are presented in the round brackets behind the average bond-lengths.

Barium-silicate		
Composition (Space group)		Site (C.N.)
Ba_2SiO_4 (Pmcn)	Ba1 (10)	Ba2 (9)
	2.98 (2.66 - 3.53)	2.88 (2.33 - 3.13)
$BaSiO_3$ (P63/mmc)	Ba1 (12)	Ba2 (12)
	2.57 (2.57)	2.58 (2.57 - 2.63)
$BaSiO_3$ (P212121)	Ba1 (8)	
	2.88 (2.68 - 3.27)	
$BaSiO_3$ (R-3mH)	Ba1 (12)	Ba2 (12)
	2.70 (2.65 - 2.76)	2.69 (2.64 - 2.78)
$BaSi_4O_9$ (P-6c2)	Ba1 (9)	
	3.01 (2.74 - 3.28)	
$BaSi_2O_5$ (Pcmn)	Ba1 (9)	
	2.92 (2.69 - 3.07)	
Ba_3SiO_5 (I4/mcm)	Ba1 (10)	Ba2 (8)
	2.99 (2.80 - 3.03)	2.81 (2.67 - 2.95)
Calcium-silicate		
Composition (Space group)		Site (C.N.)
Ca_2SiO_4 (P212121)	Ca1 (8)	Ca2 (8)
	2.50 (2.20 - 2.89)	2.49 (2.36 - 2.67)
Ca_2SiO_4 (I4/mmm)	Ca1(9)	
	2.45 (2.42 - 2.52)	
Ca_2SiO_4 (Pbnm)	Ca1 (6)	Ca2 (6)
	2.35 (2.31 - 2.38)	2.39 (2.29 - 2.44)

$CaSiO_3$ (C12/c1)	Ca1 (8)	Ca2 (8)
	2.54 (2.31 - 2.68)	2.53 (2.28 - 2.66)
	Ca3 (8)	Ca4 (8)
	2.54 (2.31 - 2.64)	2.51 (2.28 - 2.65)
	Ca5 (8)	
	2.51 (2.28 - 2.64)	
$CaSiO_3$ (P121/a1)	Ca1 (7)	Ca2 (6)
	2.42 (2.34 - 2.64)	2.39 (2.27 - 2.56)
	Ca3 (6)	
	2.39 (2.28 - 2.51)	
Europium-silicate		
Composition (Space group)		Site (C.N.)
Eu_2SiO_4 (Pnma)	Eu1 (10)	Eu2 (9)
	2.87 (2.82 - 3.03)	2.70 (2.51 - 3.10)

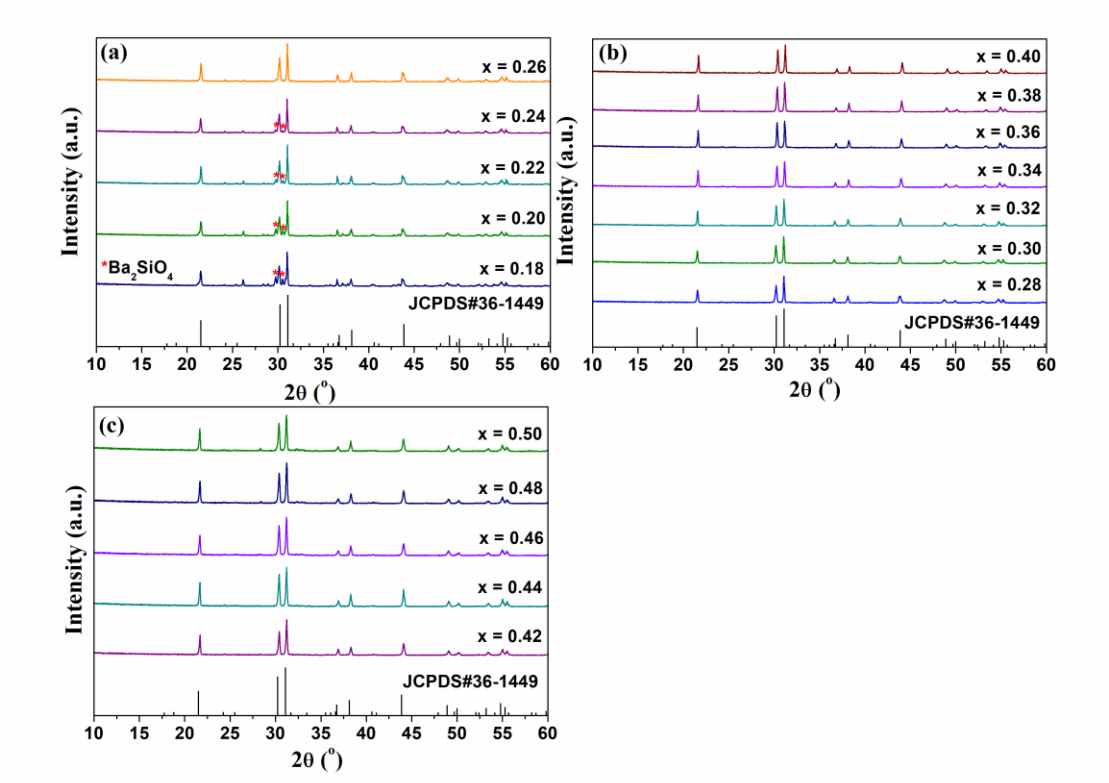

Figure S2 (a) ~ (c) The XRD patterns of $(Ba_{1-x}Ca_x)_2SiO_4$ phosphors with varying compositions.

Table S3. The Stokes-shift (cm^{-1}) and fwhm of the emission bands (cm^{-1}) of *T*-phase $(Ba_{0.99-y}Ca_yEu_{0.01})_2SiO_4$ samples with varying *y* values.

y	***SS***	**fwhm**
0.28	3202	4545
0.32	5105	5120
0.35	6172	5503
0.38	6255	5483
0.4	6665	5599