Electronic Supplementary Material (ESI) for CrystEngComm.

Table S1 Experimental layouts and results of the orthogonal experiments L_{16} (4^4)

Trial	A Er^{3+} mol%	B Y^{3+} mol%	C Ba^{2+} mol%	D amount of urea (to the stoi.)	Total intensity (red + green)/a.u.
No.1	7	8	12	1.8	11609.91
No.2	7	9	13	2.0	2370.156
No.3	7	10	14	2.2	11457.52
No.4	7	11	15	2.4	1409.297
No.5	**8**	**8**	**13**	**2.2**	**18797.06**
No.6	8	9	12	2.4	3664.16
No.7	8	10	15	1.8	18463.63
No.8	8	11	14	2.0	1517.362
No.9	9	8	14	2.4	12079.82
No.10	9	9	15	2.2	3731.027
No.11	9	10	12	2.0	11795.01
No.12	9	11	13	1.8	1046.207
No.13	10	8	15	2.0	200.067
No.14	10	9	14	1.8	3649.51
No.15	10	10	13	2.4	13265.6
No.16	10	11	12	2.2	1268.995
k_1^-	6711.721	10671.71	7084.52	8692.315	/
k_2^-	**10610.55**	3353.713	**8869.758**	3970.65	/
k_3^-	7163.016	**13745.44**	6525.226	**8813.651**	/
k_4^-	4596.044	1310.465	5951.005	7604.719	/
R	6014.506	**12434.98**	2918.753	4843.001	/

Optimum conditions from L_{16} (4^4) are: $A_2B_3C_2D_3$

(Er^{3+}: Y^{3+}: Ba^{2+}: Na^+ mol% = 8:10:13:69 mol%, urea dosage = 2.2 stoi.)

The bold in the sample indicates the optimal sample No. 5, and the bold in the average values of k indicate the optimal level of each factor

(The numbers in column A, B, C and D indicate the level values of the factors)

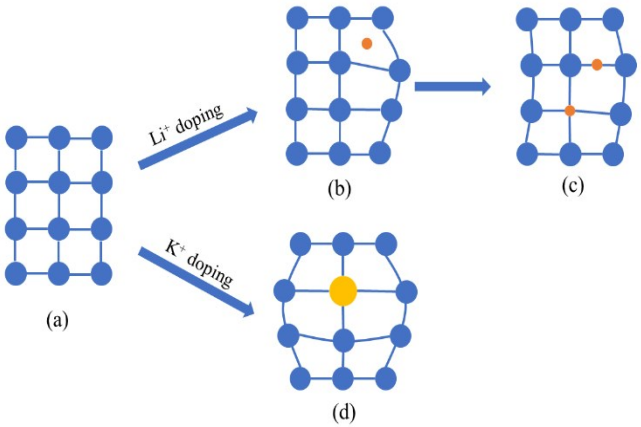

Fig. S1 Schematic illustration for the influence and formation mechanism of alkali ions introduced in $NaYF_4$ nanocrystals. (a) untreated $NaYF_4$ nanocrystals (b) Li^+ ions enter the gap of $NaYF_4$ nanocrystals (c) Li^+ ions enter the gap of $NaYF_4$ nanocrystals and occupy the lattice position (d) K^+ ions occupy the lattice position of $NaYF_4$ nanocrystals