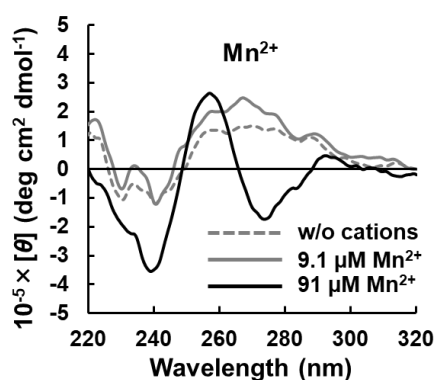


**Table S1.** All sequence data analyzed in the 8 rounds of SELEX.

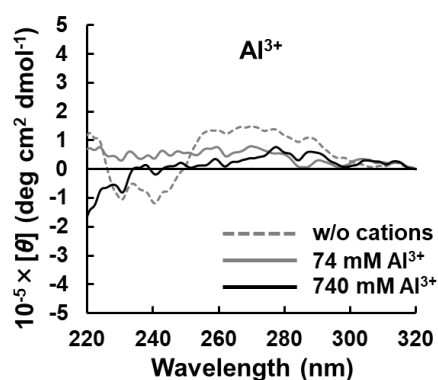
Name	Sequence	Frequency
MnG4C1	5'-AGGG-GGGGAG-TTAGGG-CGCACG-TTAGGG-GTGCTA-TTAGGG-3'	3
	5'-AGGG-CAACGT-TTAGGG-TGCATT-TTAGGG-CGTCGT-TTAGGG-3'	1
	5'-AGGG-CAGGTC-TTAGGG-TCCTCT-TTAGGG-CTTTGT-TTAGGG-3'	1
	5'-AGGG-ACAAGC-TTAGGG-CGTCCA-TTAGGG-TAACAG-TTAGGG-3'	1
	5'-AGGG-CCACTT-TTAGAA-CCAGG-TTAGGG-TAATAC-TTAGGG-3'	1
	5'-AGGG-CTGAGT-TTAGGG-TAGTAG-TTAGGG-TCTAGA-TTAGGG-3'	1
	5'-AGGG-AAGGGA-TTAGGG-GGATCG-TTAGGG-TTCGCG-TTAGGG-3'	1
	5'-AGGT-CCGGCG-TTAGGG-GCTTTG-TTAGGG-GTACTT-TTAGGG-3'	1
	5'-AGGG-GGAGAG-TTAGGG-CTGAGA-TTAGGG-CATGTA-TTAGGG-3'	1
	5'-AGGG-AGGGAG-TTAGGG-GGAGTT-TTAGGG-TCGTGT-TTAGGG-3'	1
	5'-AGGG-AATTAC-TTAGGG-TGGGGG-TTAGGG-CGTTTG-TTAGGG-3'	1
	5'-AGGG-TCTATT-TTAGGG-CCCCCA-TTAGGG-AGGTTG-TTAGGG-3'	1
	5'-AGGG-TCAGGA-TTAGGG-CCGCTA-TTAGGG-TTCCA-TTAGGG-3'	1
	5'-AGGG-AGCAAG-TTAGGG-AATTCC-TTAGGG-TGCATG-TTAGGG-3'	1
	5'-AGGG-ATTTGT-TTAGGG-GGTCTC-TTAGGG-ATAGGG-TTAGGG-3'	1
	5'-AGGG-GCCCTA-TTAGGG-GTTCCT-TTAGGG-ATCGCG-TTAGGG-3'	1
	5'-AGGG-GCTTAT-TTAGGG-CTAACG-TTAGGG-ATTCTC-TTAGGG-3'	1
	5'-AGGG-TAATCT-TTAGGG-CTGCTC-TTAGGG-AGGTGG-TTAGGG-3'	1
	5'-AGGG-GCGCAC-TTAGGG-TACACG-TTAGGG-CTTTTG-TTAGGG-3'	1
	5'-AGGG-ATATTA-TTAGGG-GCAGGT-TTAGGG-TTGTCT-TTAGGG-3'	1
	5'-AGGG-CAAACG-TTAGGG-CGCCTC-TTAGGG-GGGTAG-TTAGGG-3'	1
	5'-AGGG-ACACCT-TTAGGG-TTGTC-TTAGGG-GTATGA-TTAGGG-3'	1
	5'-AGGG-AGTCTA-TTAGGG-CCCAAT-TTAGGG-ATCTTT-TTAGGG-3'	1
	5'-AGGG-TTTAGT-TTAGGG-ATAGTG-TTAGGG-GGCATC-TTAGGG-3'	1
	5'-AGGG-TGTACC-TTAGGG-TGCGCG-TTAGGG-AACATA-TTAGGG-3'	1
	5'-AGGG-GAGCG-TTAGGG-TGCTTG-TTAGGG-3'	1
	5'-AGGG-GGATCG-TTAGGG-TTTTTG-TTAGGG-3'	1
	5'-AGGG-GTTGGTT-TTAGGG-GTTTAG-TTAGGG-3'	1
	5'-AGGG-ACTGAATTAGT-TTAGGG-3'	1
Total		31

**Table S2.** FRET efficiency in the presence of 10  $\mu\text{M}$   $\text{Na}^+$ ,  $\text{K}^+$  and  $\text{Mn}^{2+}$  using MnG4C1-FT.

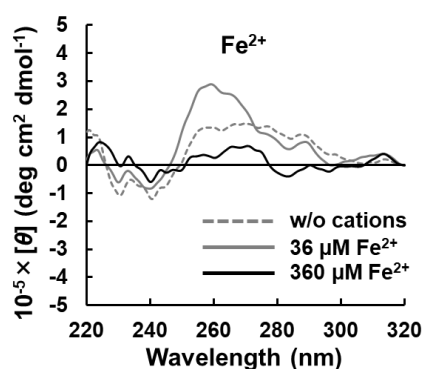
Cation species	FRET efficiency ( $\text{Int}_{.581}/\text{Int}_{.515}$ )
Mock	1.88
$\text{Na}^+$	1.81
$\text{K}^+$	1.87
$\text{Mn}^{2+}$	5.96
$\text{Na}^+ + \text{Mn}^{2+}$	5.98
$\text{K}^+ + \text{Mn}^{2+}$	5.98
$\text{Na}^+ + \text{K}^+ + \text{Mn}^{2+}$	5.76



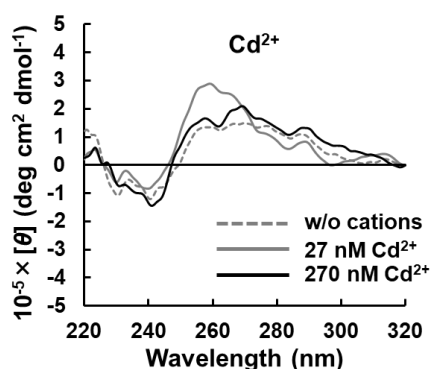
(a)



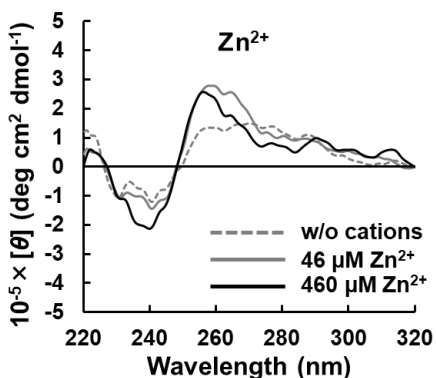
(b)



(c)

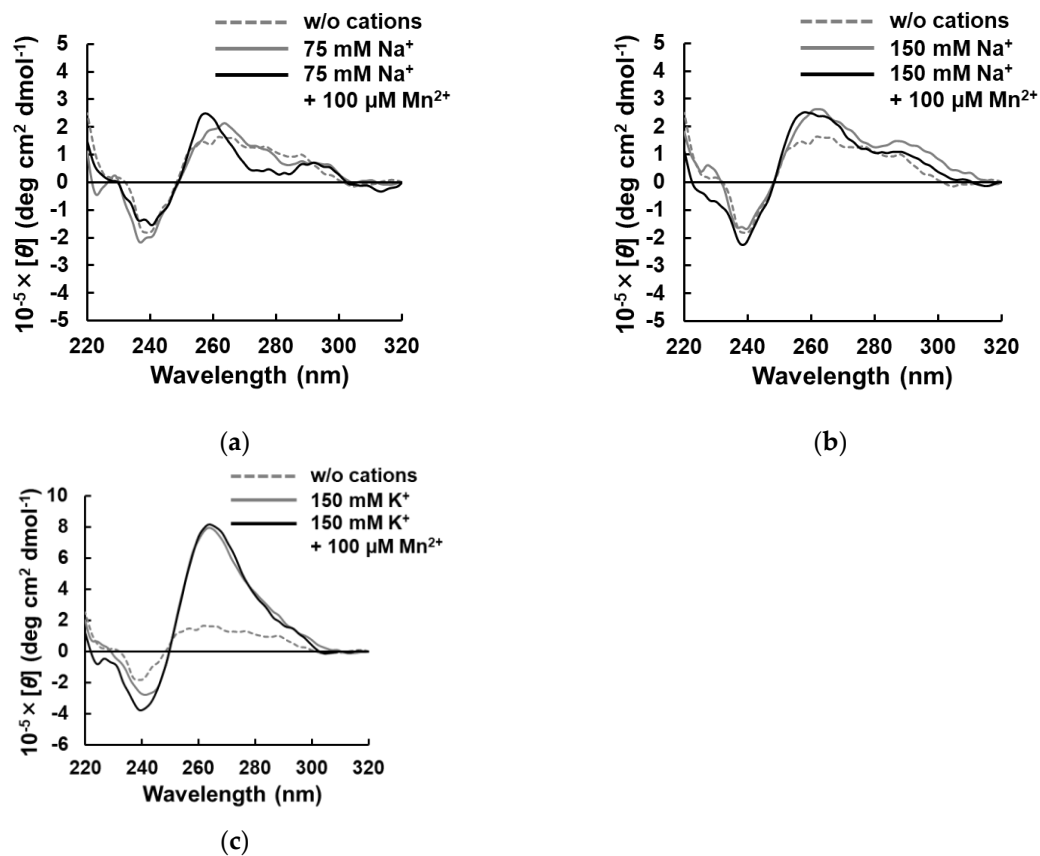


(d)

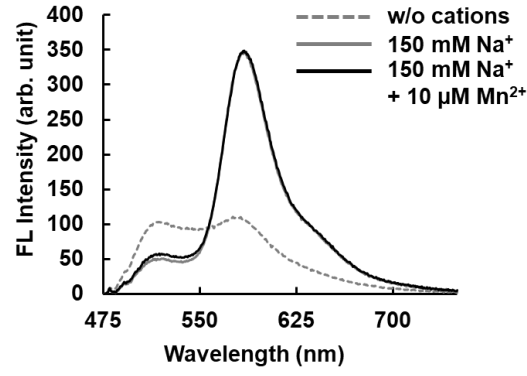


(e)

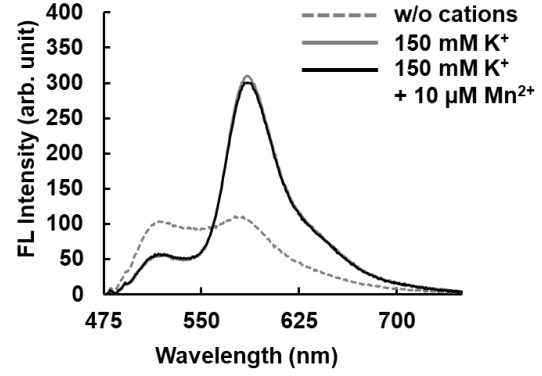
**Figure S1.** Cation specificity analysis based on the concentration of maximum residual limitation (MRL) and 10-fold MRL using CD spectroscopy. (a) CD spectra in the presence of  $\text{Mn}^{2+}$  ( $\text{Mn}^{2+}$ , 9.1  $\mu\text{M}$  for gray and 91  $\mu\text{M}$  black). (b) CD spectra in the presence of  $\text{Al}^{3+}$  ( $\text{Al}^{3+}$ , 74 mM for gray and 740 mM for black). (c) CD spectra in the presence of  $\text{Fe}^{2+}$  ( $\text{Fe}^{2+}$ , 36  $\mu\text{M}$  for gray and 360  $\mu\text{M}$  for black). (d) CD spectra in the presence of  $\text{Cd}^{2+}$  ( $\text{Cd}^{2+}$ , 27 nM for gray and 270 nM for black). (e) CD spectra in the presence of  $\text{Zn}^{2+}$  ( $\text{Zn}^{2+}$ , 46  $\mu\text{M}$  for gray and 460  $\mu\text{M}$  for black).



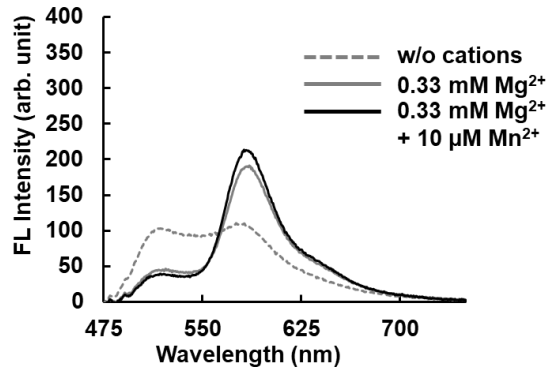
**Figure S2.** CD spectrum analysis in the presence of Na<sup>+</sup> and K<sup>+</sup>. (a) CD spectrum in the presence of 75 mM Na<sup>+</sup> and 100 μM Mn<sup>2+</sup> (75 mM Na<sup>+</sup>, gray; 75 mM Na<sup>+</sup>+100 μM Mn<sup>2+</sup>, black). (b) CD spectrum in the presence of 150 mM Na<sup>+</sup> and 100 μM Mn<sup>2+</sup> (150 mM Na<sup>+</sup>, gray; 150 mM Na<sup>+</sup>+100 μM Mn<sup>2+</sup>, black). (c) CD spectrum in the presence of 150 mM K<sup>+</sup> and 100 μM Mn<sup>2+</sup> (150 mM K<sup>+</sup>, gray; 150 mM K<sup>+</sup>+100 μM Mn<sup>2+</sup>, black).



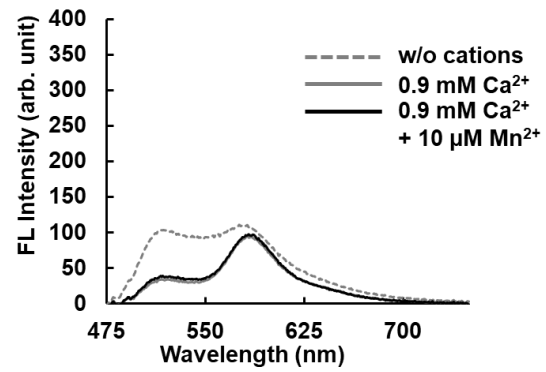
(a)



(b)



(c)



(d)

**Figure S3.** FRET analysis based on the concentration of inter/intra-cellular conditions. (a) Fluorescent spectra in the presence of 150 mM Na<sup>+</sup> and 10 μM Mn<sup>2+</sup> (150 mM Na<sup>+</sup>, gray; 150 mM Na<sup>+</sup>+10 μM Mn<sup>2+</sup>, black). (b) Fluorescent spectra in the presence of 150 mM K<sup>+</sup> and 10 μM Mn<sup>2+</sup> (150 mM K<sup>+</sup>, gray; 150 mM K<sup>+</sup>+10 μM Mn<sup>2+</sup>, black). (c) Fluorescent spectra in the presence of 0.33 mM Mg<sup>2+</sup> and 10 μM Mn<sup>2+</sup> (0.33 mM Mg<sup>2+</sup>, gray; 0.33 mM Mg<sup>2+</sup>+10 μM Mn<sup>2+</sup>, black). (d) Fluorescent spectra in the presence of 0.9 mM Ca<sup>2+</sup> and 10 μM Mn<sup>2+</sup> (0.9 mM Ca<sup>2+</sup>, gray; 0.9 mM Ca<sup>2+</sup>+10 μM Mn<sup>2+</sup>, black).