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# **Supporting Information**

Luminescent Europium(III) Complexes based on Tridentate Isoquinoline Ligands with Extremely High Quantum Yield

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### Syntheses of the ligands and complexes

Scheme S1 The assumed reaction mechanism from compound 7 to HL2.<sup>1</sup>



 S.-J. Lee, H.-S. Kim, H.-W. Yang, B.-W. Yoo and C. M. Yoon, Synthesis of Diethyl Pyridin-2-ylphosphonates and Quinolin-2-ylphosphonates by Deoxygenative Phosphorylation of the Corresponding N-Oxides, *Bulletin of the Korean Chemical Society*, 2014, 35, 2155-2158.



Fig. S1 <sup>1</sup>H (left) and <sup>13</sup>C (right) NMR spectrum of HL1.



Fig. S2 <sup>1</sup>H (left) and <sup>13</sup>C (right) NMR spectrum of HL2.



Fig. S3 <sup>31</sup>P NMR spectrum of HL1.



Fig. S4 <sup>31</sup>P NMR spectrum of HL2



Fig. S5 <sup>1</sup>H NMR spectrum of Eu1.



Fig. S6 <sup>1</sup>H NMR spectrum of **Eu2**.

### **Crystal structures**

Table S1 Continuous shape measures (CShM) of the europium complexes.

Eu1A	Eu1B	Eu1C	Eu2
26.29	26.20	27.70	24.16
12.61	13.90	12.10	15.44
18.61	19.28	18.27	19.11
15.99	15.42	16.56	16.38
11.69	11.09	12.76	12.25
12.17	11.89	12.66	11.98
5.374	5.139	5.803	7.447
5.661	5.659	5.570	7.200
6.900	6.521	7.065	7.524
4.620	4.680	4.574	6.082
13.88	14.13	13.61	13.53
14.29	14.55	14.07	13.61
5.644	5.639	5.643	7.315
	Eu1A 26.29 12.61 18.61 15.99 11.69 12.17 5.374 5.661 6.900 <b>4.620</b> 13.88 14.29 5.644	Eu1AEu1B26.2926.2012.6113.9018.6119.2815.9915.4211.6911.0912.1711.895.3745.1395.6615.6596.9006.521 <b>4.6204.680</b> 13.8814.1314.2914.555.6445.639	Eu1AEu1BEu1C26.2926.2027.7012.6113.9012.1018.6119.2818.2715.9915.4216.5611.6911.0912.7612.1711.8912.665.3745.1395.8035.6615.6595.5706.9006.5217.065 <b>4.6204.6804.574</b> 13.8814.1313.6114.2914.5514.075.6445.6395.643

<sup>a</sup>The label of EP-9, OPY-9, ..., HH-9 and MFF-9 correspond to the shape of enneagon, octagonal pyramid, heptagonal bipyramid, Johnson triangular cupola J3, capped cube J8, spherical-relaxed capped cube, capped square antiprism J10, spherical capped square antiprism, tricapped trigonal prism J51, spherical tricapped trigonal prism, tridiminished icosahedron J63, hula-hoop and muffin with symmetry of D9h, C8v, D7h, C3v, C4v, C4v, C4v, C4v, D3h, D3h, C3v, C2v and Cs, respectively.



Fig. S7 The coordination polyhedrons of **Eu1** (Eu1A (a); Eu1B (b); Eu1C (c)) and **Eu2** (d) in the c direction.



Fig. S8 Perspective view of the crystal structures of Eu1 (a) and Eu2 (b) at 50% probability level. Solvent molecules and all hydrogen atoms are omitted for clarity. Element colors: C, gray; H, white; Eu, green; N, blue; O, red; P, orange.

### **Photophysical properties**



Fig. S9 The emission spectra of **Gd1** (left) and **Gd2** (right) in solution (containing 90% ethanol, 5% methanol and 5% isopropanol, 1×10<sup>-5</sup> M) at 77 K fitted with gaussians distributions.



Fig. S10 The excitation and emission spectra of Eu1 and Eu2 in the solid state at room temperature.



Fig. S11 The emission spectra of Sm1, Nd1, and Yb1 in  $CH_2Cl_2$  (1 × 10<sup>-5</sup> M, left) and in the solid state (right) at room temperature.



Fig. S12 The luminescence decay curves of **Eu1** and **Eu2** in  $CH_2Cl_2$  (1 × 10<sup>-5</sup> M, left) and in the solid state (right) at room temperature.



Fig. S13 The luminescence decay curves of Sm1 in  $CH_2Cl_2$  (1 × 10<sup>-5</sup> M, left) and in the solid state (right) at room temperature.



Fig. S14 The luminescence decay curves of **Yb1** in  $CH_2Cl_2$  (1 × 10<sup>-5</sup> M, left) and in the solid state (right) at room temperature.