Supporting Information

**Fig. S1** The 8-coordinate environment of Dy1 ion in compound 2 completed by four nitrogen atoms and four oxygen atoms.

**Fig. S2** The 8-coordinate environment of Dy2 or Dy3 ion in compound 2 completed by eight oxygen atoms.
**Fig. S3** The 8-coordinate environment of Dy4 ion in compound 2 completed by eight oxygen atoms.

**Fig. S4** The 9-coordinate environment of Dy5 ion in compound 2 completed by nine oxygen atoms.
Fig. S5  Powder X-ray diffraction patterns of compounds 1 and 2.

Fig. S6  Thermogravimetry curves of compounds 1 and 2.
**Fig. S7** The solid-state luminescence of compound 1.

**Fig. S8** The magnetic susceptibility $\chi^{-1}$ vs. $T$ curve and the fitting curve following the Curie-Weiss law of compound 1.
Fig. S9  The magnetic susceptibility $\chi_M^{-1}$ vs. $T$ curve and the fitting curve following the Curie-Weiss law of compound 2.

Fig. S10  In-phase of ac susceptibility at indicated frequencies for 2 under 6 kOe dc field.
Fig. S11 Arrhenius plot of the natural logarithm of relaxation time against reciprocal temperature for a pure sample of 2. The solid line represents the fitting result.