

Table S1 Selected bond lengths [ $\text{\AA}$ ] and bond angles [ $^\circ$ ] in  $[\text{Zn}(\text{L1})(\text{NO}_3)_2]\cdot\text{DMF}$  (**1**).<sup>a</sup>

Zn-N1	2.134 (3)	N2-Zn-N4	151.2 (1)
Zn-N4	2.119 (3)	N2-Zn-O1b	103.7 (1)
Zn-O1b	2.043 (3)	N4-Zn-O1b	96.3 (1)
Zn-N2	2.097 (3)	N1-Zn-O1b	132.9 (1)
Zn-O1a	2.077 (3)	N2-Zn-O1a	98.5 (1)
N1-Zn-N2	75.5 (1)	N4-Zn-O1a	102.9 (1)
N1-Zn-O1a	139.3 (1)	O1a-Zn-O1b	87.7 (1)
N1-Zn-N4	75.6 (1)		

<sup>a</sup> See Fig.1 for the numbering scheme

Table S2 Observed and calculated scattering vectors for  $[\text{Eu}(\text{L3})(\text{NO}_3)_3]$  (**5**) in the  $\text{Cub}_v$  mesophase at  $170^\circ\text{C}$  (space group  $Im\bar{3}$ ,  $Ia\bar{3}$  or  $Im\bar{3}m$ ,  $a = 38.0 \text{ \AA}$ ,  $V = 54870 \text{ \AA}^3$ ).

$d_{obs}$	Intensity	$hkl$	$h^2+k^2+l^2$	$d_{calc}$
26.8	vs	110	2	26.9
19.0	s	200	4	19.0
15.5	s	211	6	15.5
13.5	m	220	8	13.4
11.95	m	310	10	12.0
4.5	broad			

Table S3 Observed and calculated scattering vectors for [Dy(L3)(NO<sub>3</sub>)<sub>3</sub>] (6) in the Cub<sub>v</sub> mesophase at 165°C (space group  $Im\bar{3}$ ,  $Ia\bar{3}$  or  $Im\bar{3}m$ ,  $a = 37.9 \text{ \AA}$ ,  $V = 54440 \text{ \AA}^3$ ).

$d_{obs}$	Intensity	$hkl$	$h^2+k^2+l^2$	$d_{calc}$
26.75	vs	110	2	26.8
19.0	s	200	4	18.95
15.6	s	211	6	15.5
13.4	m	220	8	13.4
12.0	s	310	10	12.0
10.9	vw	222	12	10.95
10.1	w	321	14	10.1
4.5	broad			

Table S4 Observed and calculated scattering vectors for [Lu(L3)(NO<sub>3</sub>)<sub>3</sub>] (7) in the Col<sub>h</sub> mesophase at 165°C (plane groups  $p6$  or  $p6mm$ ,  $a = 31.2 \text{ \AA}$ ,  $S = 842 \text{ \AA}^2$ ).

$d_{obs}$	Intensity	$hk$	$h^2+k^2+hk$	$d_{calc}$
27.1	vs	10	1	27.0
15.6	s	11	3	15.6
13.5	s	20	4	13.5
10.2	m	21	7	10.2
9.0	m	30	9	9.0
7.8	m	22	12	7.8
7.5	m	31	13	7.5
4.5	broad			

Table S5 Selected bond lengths [ $\text{\AA}$ ], bond and dihedral angles [ $^\circ$ ] in L3-C4.<sup>a</sup>

C43-C44	1.489(7)	C1-C6	1.484(6)
C43-O7	1.203(8)	C15-O2	1.203(7)
C43-O6	1.360(6)	O1-C15	1.363(5)
O6-C37	1.414(6)	C9-O1	1.415(5)
C5-C34	1.478(8)	C15-C16	1.492(6)
C44-C43-O6	111.0(5)	O1-C15-C16	110.8(4)
C43-O6-C37	120.2(4)	C9-O1-C15	120.0(4)
N1-C1-C6-N2	148.4(5)	N1-C5-C34-N4	137.6(4)
C6-N3-C13-C14	-99.5(6)	C34-N5-C41-C42	107.4(6)
C8-C9-O1-C15	-61.1(7)	C36-C37-O6-C43	-54.8(7)
C9-O1-C15-C16	-177.8(5)	C37-O6-C43-C44	-177.9(5)
O1-C15-C16-C17	3.7(7)	O6-C43-C44-C45	-174.7(5)

<sup>a</sup> See figure below for the numbering scheme.

