

## Two-dimensional dysprosium(III) triiodate(V) dihydrate, $\text{Dy}(\text{IO}_3)_3(\text{H}_2\text{O})\cdot\text{H}_2\text{O}$

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Key indicators: single-crystal X-ray study;  $T = 293$  K; mean  $\sigma(\text{Dy}-\text{O}) = 0.008$  Å;  $R$  factor = 0.038;  $wR$  factor = 0.109; data-to-parameter ratio = 16.0.

During our research into novel nonlinear optical materials using 1,10-phenanthroline as an appending ligand on lanthanide iodates, crystals of an infinite layered  $\text{Dy}^{\text{III}}$  iodate compound,  $\text{Dy}(\text{IO}_3)_3(\text{H}_2\text{O})\cdot\text{H}_2\text{O}$ , were obtained under hydrothermal conditions. The  $\text{Dy}^{\text{III}}$  cation has a dicapped trigonal prismatic coordination environment consisting of one water O atom and seven other O atoms from seven iodate anions. These iodate anions bridge the  $\text{Dy}^{\text{III}}$  cations into a two-dimensional structure. Through  $\text{O}-\text{H}\cdots\text{O}$  hydrogen bonds, all of these layers stack along [111], giving a supramolecular channel, with the solvent water molecules filling the voids.

### Related literature

For related materials with non-linear optical properties, see: Rosenzweig & Morosin (1966); Liminga *et al.* (1977); Ok & Halasyamani (2005). The method of preparation was based on  $\text{HIO}_3$ , which is different to the previous method of obtaining periodates (Douglas *et al.*, 2004; Assefa *et al.*, 2006). For noncentrosymmetric inorganic-organic framework structures synthesized from organic ligands, see: Sun *et al.* (2009). For related structures, see: Sun *et al.* (2009); Assefa *et al.* (2006); Douglas *et al.* (2004); Ok & Halasyamani (2005); Chen *et al.* (2005).

### Experimental

#### Crystal data

$\text{Dy}(\text{IO}_3)_3(\text{H}_2\text{O})\cdot\text{H}_2\text{O}$

$M_r = 723.23$

Triclinic,  $P\bar{1}$

$a = 7.15990$  (10) Å

$b = 7.4292$  (1) Å

$c = 10.64430$  (10) Å

$\alpha = 95.161$  (12)°

$\beta = 104.858$  (7)°

$\gamma = 110.081$  (8)°

$V = 504.00$  (5) Å<sup>3</sup>

$Z = 2$

Mo  $K\alpha$  radiation

$\mu = 16.65$  mm<sup>-1</sup>  
 $T = 293$  K

0.16 × 0.12 × 0.06 mm

#### Data collection

Rigaku R-Axis RAPID  
diffractometer

Absorption correction: multi-scan

(*ABSCOR*; Higashi, 1995)

$T_{\text{min}} = 0.136$ ,  $T_{\text{max}} = 0.435$

(expected range = 0.115–0.368)

3819 measured reflections

2260 independent reflections

2067 reflections with  $I > 2\sigma(I)$

$R_{\text{int}} = 0.027$

#### Refinement

$R[F^2 > 2\sigma(F^2)] = 0.038$

$wR(F^2) = 0.109$

$S = 1.06$

2260 reflections

141 parameters

2 restraints

H atoms treated by a mixture of independent and constrained refinement

$\Delta\rho_{\text{max}} = 2.79$  e Å<sup>-3</sup>

$\Delta\rho_{\text{min}} = -3.20$  e Å<sup>-3</sup>

Table 1

Hydrogen-bond geometry (Å, °).

$D-H\cdots A$	$D-H$	$H\cdots A$	$D\cdots A$	$D-H\cdots A$
$\text{O}10-\text{H}10A\cdots\text{O}3^{\text{i}}$	0.80	2.29	2.873 (10)	131
$\text{O}10-\text{H}10B\cdots\text{O}9^{\text{i}}$	0.80	2.33	2.753 (11)	114
$\text{O}11-\text{H}11A\cdots\text{O}8^{\text{ii}}$	0.80	2.22	2.954 (11)	153
$\text{O}11-\text{H}11B\cdots\text{O}7^{\text{iii}}$	0.80	2.26	2.946 (11)	145

Symmetry codes: (i)  $x, y-1, z$ ; (ii)  $x, y-1, z+1$ ; (iii)  $-x, -y-1, -z$ .

Data collection: *PROCESS-AUTO* (Rigaku, 1998); cell refinement: *PROCESS-AUTO*; data reduction: *CrystalStructure* (Rigaku/MSK, 2004); program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008) and *PLATON* (Spek, 2009; van der Sluis & Spek, 1990); molecular graphics: *SHELXTL* (Sheldrick, 2008); software used to prepare material for publication: *SHELXTL*.

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: BR2111).

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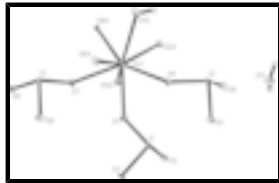
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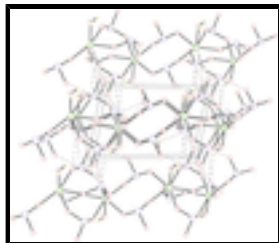
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