Acta Crystallographica Section E
Structure Reports
Online
ISSN 1600-5368

Pentaeuropium dicadmium pentaantimonide oxide, $Eu_5Cd_2Sb_5O$

Bayrammurad Saparov and Svilen Bobev*

Department of Chemistry and Biochemistry, University of Delaware, Newark, DE 19716, USA
Correspondence e-mail: sbobev@mail.chem.udel.edu

Received 16 December 2010; accepted 4 January 2011

Key indicators: single-crystal X-ray study; T = 120 K; mean σ(Eu–O) = 0.003 Å; R factor = 0.020; wR factor = 0.044; data-to-parameter ratio = 23.7.

The title compound, $Eu_5Cd_2Sb_5O$ adopts the $Ba_5Cd_2Sb_5F$-type structure (Pearson symbol *oC*52), which contains nine crystallographically unique sites in the asymmetric unit, all on special positions. One Eu, two Sb, and the Cd atom have site symmetry *m*..; two other Eu, the third Sb and the O atom have site symmetry *m*2*m*; the remaining Eu atom has 2/*m*.. symmetry. Eu atoms fill pentagonal channels built from corner-sharing $CdSb_4$ tetrahedra. The isolated O atom, *i.e.*, an oxide ion O^{2-}, is located in a distorted tetrahedral cavity formed by four Eu cations.

Related literature

For related ternary pnictides, see: Xia & Bobev (2007*a*,*b*, 2008*a*,*b*); Saparov *et al.* (2008*a*,*b*, 2010, 2011); Park & Kim (2004). For related antimonide fluorides and oxides [$A_5Cd_2Sb_5F$ (A = Sr, Ba, Eu); $Ba_5Cd_2Sb_5O_x$], see: Saparov & Bobev (2010). For another related bismuthide oxide ($Ba_2Cd_{2.13}Bi_3O$), see: Xia & Bobev (2010). For ionic and covalent radii, see: Shannon (1976); Pauling (1960).

Experimental

Crystal data

$Eu_5Cd_2Sb_5O$
M_r = 1609.37
Orthorhombic, *Cmcm*
a = 4.7088 (5) Å
b = 21.965 (2) Å
c = 14.5982 (15) Å
V = 1509.9 (3) Å^3
Z = 4
Mo $K\alpha$ radiation
μ = 31.92 mm^{-1}
T = 120 K
0.06 × 0.05 × 0.04 mm

Data collection

Bruker SMART APEX diffractometer
Absorption correction: multi-scan (*SADABS*; Bruker, 2002)
T_{min} = 0.161, T_{max} = 0.279
10204 measured reflections
1092 independent reflections
1031 reflections with $I > 2\sigma(I)$
R_{int} = 0.043

Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.020
$wR(F^2)$ = 0.044
S = 1.14
1092 reflections
46 parameters
$\Delta\rho_{max}$ = 1.18 e Å^{-3}
$\Delta\rho_{min}$ = −1.16 e Å^{-3}

Data collection: *SMART* (Bruker, 2002); cell refinement: *SAINT* (Bruker, 2002); data reduction: *SAINT*; program(s) used to solve structure: *SHELXTL* (Sheldrick, 2008); program(s) used to refine structure: *SHELXTL*; molecular graphics: *XP* in *SHELXTL*; software used to prepare material for publication: *SHELXTL*.

The authors acknowledge financial support from the University of Delaware and the Petroleum Research Fund (ACS–PRF).

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: MG2112).

References

Bruker (2002). *SMART*, *SAINT* and *SADABS*. Bruker AXS Inc., Madison, Wisconsin, USA.
Park, S.-M. & Kim, S.-J. (2004). *J. Solid State Chem.* **177**, 3418–3422.
Pauling, L. (1960). *The Nature of the Chemical Bond*, 3rd ed. Ithaca, NY: Cornell University Press.
Saparov, B. & Bobev, S. (2010). *Dalton Trans.* pp. 11335–11343.
Saparov, B., Bobev, S., Ozbay, A. & Nowak, E. R. (2008*b*). *J. Solid State Chem.* **181**, 2690–2696.
Saparov, B., He, H., Zhang, H., Greene, R. & Bobev, S. (2010). *Dalton Trans.* pp. 1063–1070.
Saparov, B., Saito, M. & Bobev, S. (2011). *J. Solid State Chem.* doi:10.1016/j.jssc.2010.12.015.
Saparov, B., Xia, S.-Q. & Bobev, S. (2008*a*). *Inorg. Chem.* **47**, 11237–11244.
Shannon, R. D. (1976). *Acta Cryst.* A**32**, 751–767.
Sheldrick, G. M. (2008). *Acta Cryst.* A**64**, 112–122.
Xia, S.-Q. & Bobev, S. (2007*a*). *J. Am. Chem. Soc.* **129**, 4049–4057.
Xia, S.-Q. & Bobev, S. (2007*b*). *J. Am. Chem. Soc.* **129**, 10011–10018.
Xia, S.-Q. & Bobev, S. (2008*a*). *J. Comput. Chem.* **29**, 2125–2133.
Xia, S.-Q. & Bobev, S. (2008*b*). *Inorg. Chem.* **47**, 1919–1921.
Xia, S.-Q. & Bobev, S. (2010). *Acta Cryst.* E**66**, i81.

supporting information

Acta Cryst. (2011). E**67**, i11 [doi:10.1107/S1600536811000274]

Pentaeuropium dicadmium pentaantimonide oxide, $Eu_5Cd_2Sb_5O$

Bayrammurad Saparov and Svilen Bobev

S1. Comment

The title compound, $Eu_5Cd_2Sb_5O$, is isostructural to $Ba_5Cd_2Sb_5F$, recently reported (Saparov & Bobev, 2010). The structure contains one-dimensional $[Cd_2Sb_5]^{9-}$ polyanions and isolated O^{2-} ions surrounded tetrahedrally by Eu cations (Fig. 1). The polyanions are constructed from two chains of corner-sharing $CdSb_4$ tetrahedra connected through Sb3 atoms and Sb2–Sb2 bonds [2.8078 (10) Å]. Similar strong homoatomic Sb–Sb interactions are found in related polyanionic Zn–Sb and Cd–Sb substructures [$Ba_3Cd_2Sb_4$ (Saparov *et al.*, 2008*a*), $Sr_{11}Cd_6Sb_{12}$ (Park & Kim, 2004; Xia & Bobev, 2008*a*), $Eu_{11}Cd_6Sb_{12}$ and $Eu_{11}Cd_6Sb_{12}$ (Saparov *et al.*, 2008*b*), $Ba_2Cd_2Sb_3$ (Saparov *et al.*, 2010)]. The Cd–Sb interactions [2.8413 (5) Å to 2.9624 (8) Å] are comparable to the sum of the covalent radii (Pauling, 1960) and to distances found in other structures based on $CdSb_4$ tetrahedra [$Ba_3Cd_2Sb_4$ (Saparov *et al.*, 2008*a*), $Ba_{21}Cd_4Sb_{18}$ (Xia and Bobev, 2008*b*), $Eu_{11}Cd_6Sb_{12}$ (Saparov *et al.*, 2008*b*), A_2CdSb_2 (Xia & Bobev, 2007*a*; Saparov *et al.*, 2011), $Sr_9Cd_{4.49(1)}Sb_9$ (Xia & Bobev, 2007*b*)].

Band structure calculations highlight the importance of ionic Ba–F interations near the Fermi level to optimize bonding in $Ba_5Cd_2Sb_5F$, but exact electron balance is achieved in the corresponding oxide $Ba_5Cd_2Sb_5O_x$ only when $x = 0.5$ (Saparov & Bobev, 2010). Whereas the fluoride is free of disorder, the oxide exhibits underoccupancy of the oxygen site, causing positional disorder of the next-nearest Ba atoms, as revealed by elongated atomic displacement parameters on the Ba2 site (modeled as a split position) in $Ba_5Cd_2Sb_5O_{0.59(3)}$. The Ba2 atoms move away from their equilibrium positions towards the empty space that results when the oxygen site is vacant. Thus, it is surprising that the present structure of $Eu_5Cd_2Sb_5O$ contains a fully occupied oxygen site, because the formula would show a one-electron deficiency, *viz.* $(Eu^{2+})_5(Cd^{2+})_2(Sb^{3-})_3(Sb^{2-})_2(O^{2-})$. A possible resolution is to propose the occurrence of Eu in both +2 and +3 oxidation states. Because phase-pure samples were unavailable, magnetic measurements could not be performed to verify this proposal. Nevertheless, we note that the Eu1–O distance [2.528 (4) Å] is only 0.4% longer than the Eu1–F distance in $Eu_5Cd_2Sb_5F$ (Saparov & Bobev, 2010); this increase does not scale with the difference between the ionic radii of O^{2-} and F^-, the former being nearly 5% bigger than the latter (Shannon, 1976). A similar conclusion can be drawn by comparing the Eu2–O [2.634 (3) Å] and Eu2–F [2.635 (3) Å] distances.

S2. Experimental

The reagents were handled in an argon-filled glove box or under vacuum. All metals were with a stated purity higher than 99.9% (metal basis). They were purchased from Alfa, kept in the glove box, and were used as received.

A mixture of elemental Eu, Cd, Sb, and Pb (flux) in a molar ratio Eu:Cd:Sb:Pb = 2:1:2:10 was loaded in an alumina crucible. To prevent oxidation, the elements were weighed inside the glove box, but the mixture was accidently left in contact with ambient air for *ca.* 20–30 minutes, prior to sealing it under vacuum inside a silica tube. After that, the reaction mixture was put in a box-furnace and heated to 1273 K at a rate of 200 K h^{-1}, homogenized at this temperature for 24 h, and then slowly cooled to 823 K at a rate of 5 K h^{-1}. After an equilibration step at 823 K for 96 h, the crystals were separated from the Pb flux.

This reaction was aimed at obtaining large single-crystals of $Eu_{11}Cd_6Sb_{12}$ (Saparov *et al.*, 2008*b*), which was indeed the major product. However, alongside the needle crystals of $Eu_{11}Cd_6Sb_{12}$, a small block-shaped crystal was also found. After the X-ray data were collected and the structure was solved, it turned out to be that of $Eu_5Cd_2Sb_5O$. Other reactions using the same starting materials produced only the intermetallic phase, suggesting that the likely source of oxygen in this particular experiment was an unexpected partial oxidation. Attempts to increase the yield by using Eu_2O_3 as a deliberate source of oxygen were not successful and yielded multiple phases. Reactions aimed at obtaining the isostructural $Eu_5Cd_2Sb_5F$ (Saparov & Bobev, 2010) were successful – they were performed using CdF_2 (Alfa), Eu, Cd, and Sb.

S3. Refinement

Because the determined unit-cell dimensions and space group suggested isomorphism with $Ba_5Cd_2Sb_5F$ (Saparov & Bobev, 2010), the diffraction data were readily refined using this model. The refinements smoothly converged to low conventional residuals and a flat difference Fourier map. The maximum peak and deepest hole were located 0.86 Å from Eu2 and 0.93 Å from O, respectively.

We note that when oxygen was excluded from the model, a residual peak of about 15 e^- $Å^{-3}$, located *ca.* 2.6–2.7 Å from Eu, remained in the difference Fourier map. Unlike the case of $Ba_2Cd_{3-\delta}Bi_3O$ (Xia & Bobev, 2010), where the residual density lacked the typical oxoanion coordination and was modeled as a partially occupied Cd site, here the tetrahedral coordination by Eu matches very well the bonding requirements of O^{2-}. The distances are reasonable and the oxygen site was fully occupied, as verified by freeing the site occupation factor, which led to an occupancy factor of 1.05 (2). In the final refinement cycles, all atoms were refined as fully occupied.

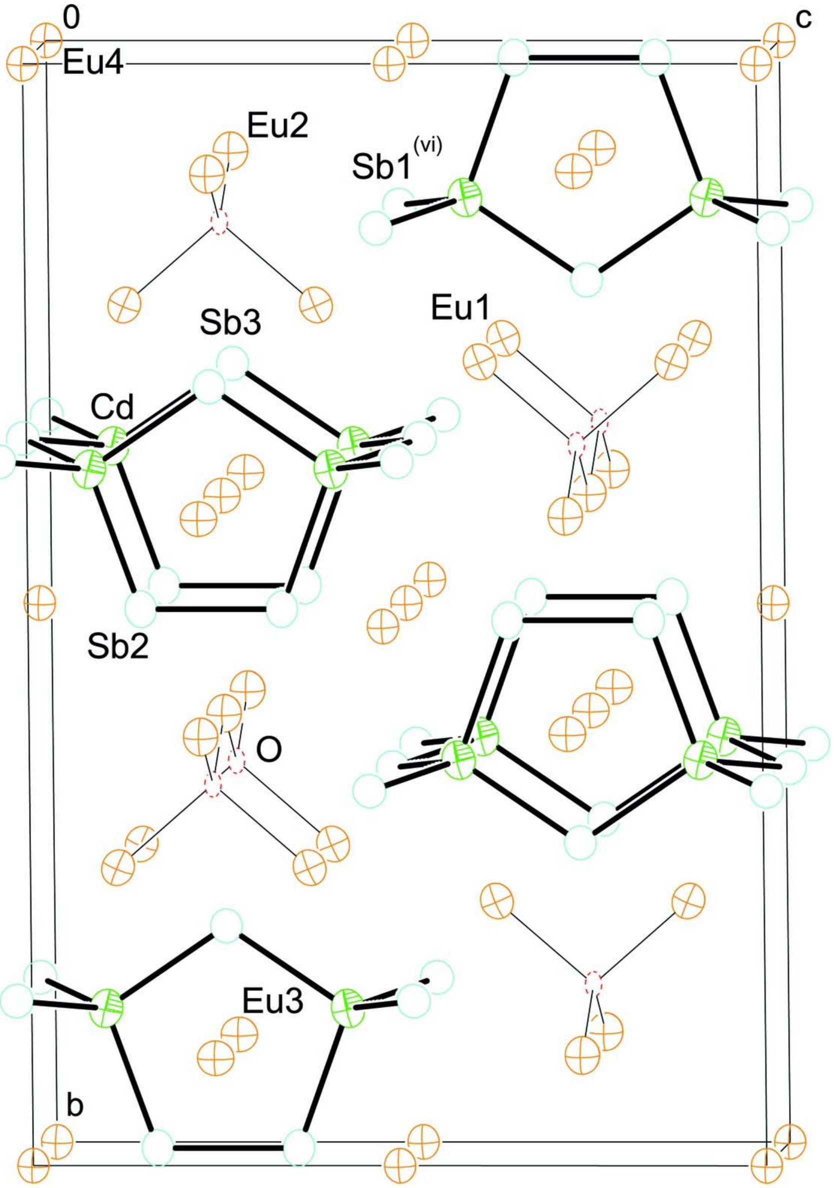

Figure 1

Projection of $Eu_5Cd_2Sb_5O$ approximately along [100]. Displacement ellipsoids are drawn at the 95% probability level. Color key: Eu orange, Cd green, Sb turquoise, O red. Symmetry transformation used to generate the equivalent Sb atom: (vi) x,y,-z+1/2.

Pentaeuropium dicadmium pentaantimonide oxide

Crystal data

$Eu_5Cd_2Sb_5O$	$V = 1509.9$ (3) Å^3
$M_r = 1609.37$	$Z = 4$
Orthorhombic, *Cmcm*	$F(000) = 2702$
Hall symbol: -C 2c 2	$D_x = 7.078$ Mg m^{-3}
$a = 4.7088$ (5) Å	Mo $K\alpha$ radiation, $\lambda = 0.71073$ Å
$b = 21.965$ (2) Å	Cell parameters from 1092 reflections
$c = 14.5982$ (15) Å	$\theta = 1.9$–28.3°

$\mu = 31.92$ mm^{-1}
$T = 120$ K

Block, black
0.06 × 0.05 × 0.04 mm

Data collection

Bruker SMART APEX diffractometer
Radiation source: fine-focus sealed tube
Graphite monochromator
ω scans
Absorption correction: multi-scan (*SADABS*; Bruker, 2002)
$T_{\min} = 0.161$, $T_{\max} = 0.279$

10204 measured reflections
1092 independent reflections
1031 reflections with $I > 2\sigma(I)$
$R_{\text{int}} = 0.043$
$\theta_{\max} = 28.3°$, $\theta_{\min} = 1.9°$
$h = -6 \rightarrow 6$
$k = -28 \rightarrow 28$
$l = -19 \rightarrow 19$

Refinement

Refinement on F^2
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)] = 0.020$
$wR(F^2) = 0.044$
$S = 1.14$
1092 reflections
46 parameters
0 restraints
Primary atom site location: structure-invariant direct methods

Secondary atom site location: difference Fourier map
$w = 1/[\sigma^2(F_o^2) + (0.0174P)^2 + 9.1021P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{\max} = 0.001$
$\Delta\rho_{\max} = 1.18$ e Å^{-3}
$\Delta\rho_{\min} = -1.16$ e Å^{-3}
Extinction correction: *SHELXTL* (Bruker, 2002), $Fc^*=kFc[1+0.001xFc^2\lambda^3/\sin(2\theta)]^{-1/4}$
Extinction coefficient: 0.000112 (14)

Special details

Experimental. Selected in the glove box, crystals were put in a Paratone N oil and cut to the desired dimensions. Chosen crystal was mounted on a tip of a glass fiber and quickly onto the goniometer. The crystal was kept under a cold nitrogen stream to protect from ambient conditions.
Data collection is performed with four batch runs at $\varphi = 0.00$ ° (600 frames), at $\varphi = 90.00$ ° (600 frames), at $\varphi = 180.00$ ° (600 frames), and at $\varphi = 270.00$ (600 frames). Frame width = 0.30 ° in ω. Data are merged and treated with multi-scan absorption corrections.

Geometry. All e.s.d.'s (except the e.s.d. in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell e.s.d.'s are taken into account individually in the estimation of e.s.d.'s in distances, angles and torsion angles; correlations between e.s.d.'s in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell e.s.d.'s is used for estimating e.s.d.'s involving l.s. planes.

Refinement. Refinement of F^2 against ALL reflections. The weighted R-factor wR and goodness of fit S are based on F^2, conventional R-factors R are based on F, with F set to zero for negative F^2. The threshold expression of $F^2 > \sigma(F^2)$ is used only for calculating R-factors(gt) *etc*. and is not relevant to the choice of reflections for refinement. R-factors based on F^2 are statistically about twice as large as those based on F, and R- factors based on ALL data will be even larger.

Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å^2)

	x	y	z	$U_{\text{iso}}*/U_{\text{eq}}$
Eu1	0.0000	0.270509 (17)	0.61940 (3)	0.01436 (11)
Eu2	0.0000	0.10016 (3)	0.2500	0.02034 (14)
Eu3	0.0000	0.90247 (2)	0.2500	0.01461 (12)
Eu4	0.0000	0.0000	0.0000	0.01393 (12)
Sb1	0.0000	0.14937 (2)	0.02068 (3)	0.01333 (12)
Sb2	0.0000	0.49492 (2)	0.15383 (3)	0.01439 (12)
Sb3	0.0000	0.29312 (3)	0.2500	0.01319 (15)
Cd	0.0000	0.36803 (3)	0.08509 (4)	0.01540 (13)
O	0.0000	0.6539 (3)	0.2500	0.0058 (12)

Atomic displacement parameters (Å²)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Eu1	0.01347 (18)	0.01609 (19)	0.01352 (19)	0.000	0.000	0.00131 (14)
Eu2	0.0283 (3)	0.0179 (3)	0.0148 (3)	0.000	0.000	0.000
Eu3	0.0119 (2)	0.0152 (3)	0.0167 (3)	0.000	0.000	0.000
Eu4	0.0145 (3)	0.0151 (3)	0.0122 (2)	0.000	0.000	−0.00009 (19)
Sb1	0.0121 (2)	0.0142 (2)	0.0136 (2)	0.000	0.000	−0.00025 (18)
Sb2	0.0137 (2)	0.0171 (2)	0.0123 (2)	0.000	0.000	0.00042 (18)
Sb3	0.0123 (3)	0.0146 (3)	0.0127 (3)	0.000	0.000	0.000
Cd	0.0137 (3)	0.0186 (3)	0.0140 (3)	0.000	0.000	−0.0012 (2)
O	0.006 (3)	0.008 (3)	0.003 (3)	0.000	0.000	0.000

Geometric parameters (Å, º)

Eu1—O^{i}	2.528 (4)	Sb1—Eu1^{xvi}	3.2738 (5)
Eu1—Sb1^{ii}	3.2738 (5)	Sb1—Eu1^{xvii}	3.2738 (5)
Eu1—Sb1^{iii}	3.2738 (5)	Sb1—Eu1^{vi}	3.3559 (7)
Eu1—Sb3^{iv}	3.3363 (4)	Sb2—Sb2^{vi}	2.8078 (10)
Eu1—Sb3^{v}	3.3363 (4)	Sb2—Cd	2.9624 (8)
Eu1—Sb1^{vi}	3.3559 (7)	Sb2—Eu4^{ix}	3.2556 (4)
Eu2—O^{vii}	2.634 (3)	Sb2—Eu4^{x}	3.2556 (4)
Eu2—O^{viii}	2.634 (3)	Sb2—Eu3^{viii}	3.4115 (5)
Eu3—Sb3^{ix}	3.3634 (7)	Sb2—Eu3^{vii}	3.4115 (5)
Eu3—Sb3^{x}	3.3634 (7)	Sb3—Cd	2.9160 (7)
Eu3—Sb2^{xi}	3.4115 (5)	Sb3—Cd^{vi}	2.9160 (7)
Eu3—Sb2^{x}	3.4115 (5)	Sb3—Eu1^{xvii}	3.3363 (4)
Eu3—Sb2^{ix}	3.4115 (5)	Sb3—Eu1^{iv}	3.3363 (4)
Eu3—Sb2^{xii}	3.4115 (5)	Sb3—Eu1^{v}	3.3363 (4)
Eu3—Cd^{ix}	3.4512 (5)	Sb3—Eu1^{xvi}	3.3363 (4)
Eu3—Cd^{xi}	3.4512 (5)	Sb3—Eu3^{vii}	3.3634 (7)
Eu3—Cd^{xii}	3.4512 (5)	Sb3—Eu3^{viii}	3.3634 (7)
Eu3—Cd^{x}	3.4512 (5)	Cd—Sb1^{xiii}	2.8413 (5)
Eu4—Sb2^{xiii}	3.2556 (4)	Cd—Sb1^{xiv}	2.8413 (5)
Eu4—Sb2^{vii}	3.2556 (4)	Cd—Eu3^{vii}	3.4512 (5)
Eu4—Sb2^{xiv}	3.2556 (4)	Cd—Eu3^{viii}	3.4512 (5)
Eu4—Sb2^{viii}	3.2556 (4)	O—Eu1^{i}	2.528 (4)
Eu4—Sb1	3.2947 (6)	O—Eu1^{xviii}	2.528 (4)
Eu4—Sb1^{xv}	3.2948 (6)	O—Eu2^{ix}	2.634 (3)
Sb1—Cd^{xiii}	2.8413 (5)	O—Eu2^{x}	2.634 (3)
Sb1—Cd^{xiv}	2.8413 (5)		
O^{i}—Eu1—Sb1^{ii}	88.79 (8)	Sb2^{xiii}—Eu4—Sb2^{viii}	87.362 (15)
O^{i}—Eu1—Sb1^{iii}	88.79 (8)	Sb2^{vii}—Eu4—Sb2^{viii}	92.638 (15)
Sb1^{ii}—Eu1—Sb1^{iii}	91.972 (17)	Sb2^{xiv}—Eu4—Sb2^{viii}	180.00 (2)
O^{i}—Eu1—Sb3^{iv}	81.04 (8)	Sb2^{xiii}—Eu4—Sb1	91.665 (10)
Sb1^{ii}—Eu1—Sb3^{iv}	88.237 (12)	Sb2^{vii}—Eu4—Sb1	88.335 (10)
Sb1^{iii}—Eu1—Sb3^{iv}	169.821 (18)	Sb2^{xiv}—Eu4—Sb1	91.665 (10)

O^{i}—Eu1—Sb3^{v}	81.04 (8)	Sb2^{viii}—Eu4—Sb1	88.335 (10)
Sb1^{ii}—Eu1—Sb3^{v}	169.821 (18)	Sb2^{xiii}—Eu4—Sb1^{xv}	88.335 (10)
Sb1^{iii}—Eu1—Sb3^{v}	88.237 (12)	Sb2^{vii}—Eu4—Sb1^{xv}	91.665 (10)
Sb3^{iv}—Eu1—Sb3^{v}	89.772 (15)	Sb2^{xiv}—Eu4—Sb1^{xv}	88.335 (10)
O^{i}—Eu1—Sb1^{vi}	168.60 (11)	Sb2^{viii}—Eu4—Sb1^{xv}	91.665 (10)
Sb1^{ii}—Eu1—Sb1^{vi}	99.089 (14)	Sb1—Eu4—Sb1^{xv}	180.0
Sb1^{iii}—Eu1—Sb1^{vi}	99.089 (14)	Sb2^{xiii}—Eu4—Cd^{xiv}	100.934 (11)
Sb3^{iv}—Eu1—Sb1^{vi}	90.921 (15)	Sb2^{vii}—Eu4—Cd^{xiv}	79.066 (11)
Sb3^{v}—Eu1—Sb1^{vi}	90.921 (15)	Sb2^{xiv}—Eu4—Cd^{xiv}	47.500 (11)
O^{i}—Eu1—Cd^{vi}	103.28 (11)	Sb2^{viii}—Eu4—Cd^{xiv}	132.500 (11)
Sb1^{ii}—Eu1—Cd^{vi}	47.849 (9)	Sb1—Eu4—Cd^{xiv}	45.208 (9)
Sb1^{iii}—Eu1—Cd^{vi}	47.849 (9)	Sb1^{xv}—Eu4—Cd^{xiv}	134.793 (9)
Sb3^{iv}—Eu1—Cd^{vi}	135.111 (8)	Sb2^{xiii}—Eu4—Cd^{viii}	79.066 (11)
Sb3^{v}—Eu1—Cd^{vi}	135.111 (7)	Sb2^{vii}—Eu4—Cd^{viii}	100.934 (11)
Sb1^{vi}—Eu1—Cd^{vi}	88.118 (17)	Sb2^{xiv}—Eu4—Cd^{viii}	132.500 (11)
O^{i}—Eu1—Eu1^{xix}	41.06 (11)	Sb2^{viii}—Eu4—Cd^{viii}	47.500 (11)
Sb1^{ii}—Eu1—Eu1^{xix}	116.120 (11)	Sb1—Eu4—Cd^{viii}	134.792 (9)
Sb1^{iii}—Eu1—Eu1^{xix}	116.120 (11)	Sb1^{xv}—Eu4—Cd^{viii}	45.207 (9)
Sb3^{iv}—Eu1—Eu1^{xix}	55.150 (8)	Cd^{xiv}—Eu4—Cd^{viii}	180.000 (19)
Sb3^{v}—Eu1—Eu1^{xix}	55.150 (8)	Sb2^{xiii}—Eu4—Cd^{xiii}	47.500 (11)
Sb1^{vi}—Eu1—Eu1^{xix}	127.542 (11)	Sb2^{vii}—Eu4—Cd^{xiii}	132.500 (11)
Cd^{vi}—Eu1—Eu1^{xix}	144.340 (11)	Sb2^{xiv}—Eu4—Cd^{xiii}	100.934 (11)
O^{i}—Eu1—Cd^{iii}	127.77 (7)	Sb2^{viii}—Eu4—Cd^{xiii}	79.066 (11)
Sb1^{ii}—Eu1—Cd^{iii}	143.242 (16)	Sb1—Eu4—Cd^{xiii}	45.208 (9)
Sb1^{iii}—Eu1—Cd^{iii}	85.892 (12)	Sb1^{xv}—Eu4—Cd^{xiii}	134.793 (9)
Sb3^{iv}—Eu1—Cd^{iii}	99.991 (16)	Cd^{xiv}—Eu4—Cd^{xiii}	73.486 (12)
Sb3^{v}—Eu1—Cd^{iii}	46.924 (12)	Cd^{viii}—Eu4—Cd^{xiii}	106.514 (12)
Sb1^{vi}—Eu1—Cd^{iii}	45.530 (10)	Sb2^{xiii}—Eu4—Cd^{vii}	132.500 (11)
Cd^{vi}—Eu1—Cd^{iii}	110.630 (13)	Sb2^{vii}—Eu4—Cd^{vii}	47.500 (11)
Eu1^{xix}—Eu1—Cd^{iii}	97.418 (10)	Sb2^{xiv}—Eu4—Cd^{vii}	79.066 (11)
O^{i}—Eu1—Cd^{ii}	127.77 (7)	Sb2^{viii}—Eu4—Cd^{vii}	100.934 (11)
Sb1^{ii}—Eu1—Cd^{ii}	85.892 (13)	Sb1—Eu4—Cd^{vii}	134.792 (9)
Sb1^{iii}—Eu1—Cd^{ii}	143.242 (17)	Sb1^{xv}—Eu4—Cd^{vii}	45.207 (9)
Sb3^{iv}—Eu1—Cd^{ii}	46.924 (12)	Cd^{xiv}—Eu4—Cd^{vii}	106.514 (12)
Sb3^{v}—Eu1—Cd^{ii}	99.991 (17)	Cd^{viii}—Eu4—Cd^{vii}	73.486 (12)
Sb1^{vi}—Eu1—Cd^{ii}	45.530 (10)	Cd^{xiii}—Eu4—Cd^{vii}	180.000 (19)
Cd^{vi}—Eu1—Cd^{ii}	110.630 (13)	Sb2^{xiii}—Eu4—Eu3^{xxiv}	127.751 (9)
Eu1^{xix}—Eu1—Cd^{ii}	97.418 (10)	Sb2^{vii}—Eu4—Eu3^{xxiv}	52.249 (9)
Cd^{iii}—Eu1—Cd^{ii}	74.719 (14)	Sb2^{xiv}—Eu4—Eu3^{xxiv}	127.751 (9)
O^{i}—Eu1—Eu2^{iv}	37.31 (4)	Sb2^{viii}—Eu4—Eu3^{xxiv}	52.249 (9)
Sb1^{ii}—Eu1—Eu2^{iv}	55.018 (11)	Sb1—Eu4—Eu3^{xxiv}	115.157 (11)
Sb1^{iii}—Eu1—Eu2^{iv}	104.009 (15)	Sb1^{xv}—Eu4—Eu3^{xxiv}	64.843 (11)
Sb3^{iv}—Eu1—Eu2^{iv}	67.923 (14)	Cd^{xiv}—Eu4—Eu3^{xxiv}	130.170 (8)
Sb3^{v}—Eu1—Eu2^{iv}	115.104 (14)	Cd^{viii}—Eu4—Eu3^{xxiv}	49.830 (8)
Sb1^{vi}—Eu1—Eu2^{iv}	145.294 (6)	Cd^{xiii}—Eu4—Eu3^{xxiv}	130.170 (8)
Cd^{vi}—Eu1—Eu2^{iv}	88.522 (13)	Cd^{vii}—Eu4—Eu3^{xxiv}	49.830 (8)
Eu1^{xix}—Eu1—Eu2^{iv}	62.674 (7)	Sb2^{xiii}—Eu4—Eu3^{xxv}	52.249 (9)
Cd^{iii}—Eu1—Eu2^{iv}	160.009 (14)	Sb2^{vii}—Eu4—Eu3^{xxv}	127.751 (9)

Cd^{ii}—Eu1—Eu2^{iv}	104.580 (11)	Sb2^{xiv}—Eu4—Eu3^{xxv}	52.249 (9)
O^{i}—Eu1—Eu2^{v}	37.31 (4)	Sb2^{viii}—Eu4—Eu3^{xxv}	127.751 (9)
Sb1^{ii}—Eu1—Eu2^{v}	104.009 (15)	Sb1—Eu4—Eu3^{xxv}	64.843 (11)
Sb1^{iii}—Eu1—Eu2^{v}	55.018 (11)	Sb1^{xv}—Eu4—Eu3^{xxv}	115.157 (11)
Sb3^{iv}—Eu1—Eu2^{v}	115.104 (13)	Cd^{xiv}—Eu4—Eu3^{xxv}	49.830 (8)
Sb3^{v}—Eu1—Eu2^{v}	67.923 (14)	Cd^{viii}—Eu4—Eu3^{xxv}	130.170 (8)
Sb1^{vi}—Eu1—Eu2^{v}	145.294 (6)	Cd^{xiii}—Eu4—Eu3^{xxv}	49.830 (8)
Cd^{vi}—Eu1—Eu2^{v}	88.522 (12)	Cd^{vii}—Eu4—Eu3^{xxv}	130.170 (8)
Eu1^{xix}—Eu1—Eu2^{v}	62.674 (6)	Eu3^{xxiv}—Eu4—Eu3^{xxv}	180.000 (12)
Cd^{iii}—Eu1—Eu2^{v}	104.580 (11)	Cd^{xiii}—Sb1—Cd^{xiv}	111.92 (3)
Cd^{ii}—Eu1—Eu2^{v}	160.009 (14)	Cd^{xiii}—Sb1—Eu1^{xvi}	155.15 (2)
Eu2^{iv}—Eu1—Eu2^{v}	69.070 (12)	Cd^{xiv}—Sb1—Eu1^{xvi}	73.476 (13)
O^{vii}—Eu2—O^{viii}	126.7 (2)	Cd^{xiii}—Sb1—Eu1^{xvii}	73.476 (13)
O^{vii}—Eu2—Sb1	82.09 (3)	Cd^{xiv}—Sb1—Eu1^{xvii}	155.15 (2)
O^{viii}—Eu2—Sb1	82.09 (3)	Eu1^{xvi}—Sb1—Eu1^{xvii}	91.971 (17)
O^{vii}—Eu2—Sb1^{vi}	82.09 (3)	Cd^{xiii}—Sb1—Eu4	79.416 (15)
O^{viii}—Eu2—Sb1^{vi}	82.09 (3)	Cd^{xiv}—Sb1—Eu4	79.416 (15)
Sb1—Eu2—Sb1^{vi}	144.21 (2)	Eu1^{xvi}—Sb1—Eu4	125.146 (12)
O^{vii}—Eu2—Sb2^{viii}	151.15 (7)	Eu1^{xvii}—Sb1—Eu4	125.146 (11)
O^{viii}—Eu2—Sb2^{viii}	72.66 (11)	Cd^{xiii}—Sb1—Eu1^{vi}	77.026 (16)
Sb1—Eu2—Sb2^{viii}	79.950 (11)	Cd^{xiv}—Sb1—Eu1^{vi}	77.026 (16)
Sb1^{vi}—Eu2—Sb2^{viii}	124.796 (11)	Eu1^{xvi}—Sb1—Eu1^{vi}	80.908 (14)
O^{vii}—Eu2—Sb2^{xx}	151.15 (7)	Eu1^{xvii}—Sb1—Eu1^{vi}	80.908 (14)
O^{viii}—Eu2—Sb2^{xx}	72.66 (11)	Eu4—Sb1—Eu1^{vi}	137.202 (18)
Sb1—Eu2—Sb2^{xx}	124.795 (11)	Cd^{xiii}—Sb1—Eu2	118.413 (15)
Sb1^{vi}—Eu2—Sb2^{xx}	79.951 (11)	Cd^{xiv}—Sb1—Eu2	118.413 (15)
Sb2^{viii}—Eu2—Sb2^{xx}	46.098 (17)	Eu1^{xvi}—Sb1—Eu2	75.300 (13)
O^{vii}—Eu2—Sb2^{xxi}	72.66 (11)	Eu1^{xvii}—Sb1—Eu2	75.300 (13)
O^{viii}—Eu2—Sb2^{xxi}	151.15 (7)	Eu4—Sb1—Eu2	77.364 (14)
Sb1—Eu2—Sb2^{xxi}	124.795 (11)	Eu1^{vi}—Sb1—Eu2	145.435 (19)
Sb1^{vi}—Eu2—Sb2^{xxi}	79.951 (11)	Sb2^{vi}—Sb2—Cd	109.800 (15)
Sb2^{viii}—Eu2—Sb2^{xxi}	99.72 (2)	Sb2^{vi}—Sb2—Eu4^{ix}	133.614 (8)
Sb2^{xx}—Eu2—Sb2^{xxi}	82.082 (16)	Cd—Sb2—Eu4^{ix}	78.379 (13)
O^{vii}—Eu2—Sb2^{vii}	72.66 (11)	Sb2^{vi}—Sb2—Eu4^{x}	133.614 (8)
O^{viii}—Eu2—Sb2^{vii}	151.15 (7)	Cd—Sb2—Eu4^{x}	78.379 (13)
Sb1—Eu2—Sb2^{vii}	79.950 (11)	Eu4^{ix}—Sb2—Eu4^{x}	92.637 (15)
Sb1^{vi}—Eu2—Sb2^{vii}	124.796 (11)	Sb2^{vi}—Sb2—Eu3^{viii}	65.699 (9)
Sb2^{viii}—Eu2—Sb2^{vii}	82.082 (17)	Cd—Sb2—Eu3^{viii}	65.122 (14)
Sb2^{xx}—Eu2—Sb2^{vii}	99.72 (2)	Eu4^{ix}—Sb2—Eu3^{viii}	78.764 (8)
Sb2^{xxi}—Eu2—Sb2^{vii}	46.098 (17)	Eu4^{x}—Sb2—Eu3^{viii}	143.452 (18)
O^{vii}—Eu2—Eu1^{iv}	35.58 (8)	Sb2^{vi}—Sb2—Eu3^{vii}	65.699 (9)
O^{viii}—Eu2—Eu1^{iv}	101.55 (11)	Cd—Sb2—Eu3^{vii}	65.122 (14)
Sb1—Eu2—Eu1^{iv}	103.103 (14)	Eu4^{ix}—Sb2—Eu3^{vii}	143.452 (18)
Sb1^{vi}—Eu2—Eu1^{iv}	49.682 (9)	Eu4^{x}—Sb2—Eu3^{vii}	78.764 (8)
Sb2^{viii}—Eu2—Eu1^{iv}	173.179 (9)	Eu3^{viii}—Sb2—Eu3^{vii}	87.282 (17)
Sb2^{xx}—Eu2—Eu1^{iv}	129.306 (11)	Sb2^{vi}—Sb2—Eu2^{x}	66.952 (9)
Sb2^{xxi}—Eu2—Eu1^{iv}	83.628 (11)	Cd—Sb2—Eu2^{x}	137.661 (10)
Sb2^{vii}—Eu2—Eu1^{iv}	104.387 (9)	Eu4^{ix}—Sb2—Eu2^{x}	136.289 (17)

O^{vii}—Eu2—Eu1^{xvi}	35.58 (8)
O^{viii}—Eu2—Eu1^{xvi}	101.55 (11)
Sb1—Eu2—Eu1^{xvi}	49.683 (9)
Sb1^{vi}—Eu2—Eu1^{xvi}	103.102 (15)
Sb2^{viii}—Eu2—Eu1^{xvi}	129.306 (11)
Sb2^{xx}—Eu2—Eu1^{xvi}	173.179 (9)
Sb2^{xxi}—Eu2—Eu1^{xvi}	104.387 (10)
Sb2^{vii}—Eu2—Eu1^{xvi}	83.628 (11)
Eu1^{iv}—Eu2—Eu1^{xvi}	54.653 (13)
O^{vii}—Eu2—Eu1^{v}	101.55 (11)
O^{viii}—Eu2—Eu1^{v}	35.58 (8)
Sb1—Eu2—Eu1^{v}	103.103 (15)
Sb1^{vi}—Eu2—Eu1^{v}	49.682 (9)
Sb2^{viii}—Eu2—Eu1^{v}	104.387 (9)
Sb2^{xx}—Eu2—Eu1^{v}	83.628 (11)
Sb2^{xxi}—Eu2—Eu1^{v}	129.306 (11)
Sb2^{vii}—Eu2—Eu1^{v}	173.179 (9)
Eu1^{iv}—Eu2—Eu1^{v}	69.069 (12)
Eu1^{xvi}—Eu2—Eu1^{v}	93.682 (16)
O^{vii}—Eu2—Eu1^{xvii}	101.55 (11)
O^{viii}—Eu2—Eu1^{xvii}	35.58 (8)
Sb1—Eu2—Eu1^{xvii}	49.683 (9)
Sb1^{vi}—Eu2—Eu1^{xvii}	103.102 (14)
Sb2^{viii}—Eu2—Eu1^{xvii}	83.628 (11)
Sb2^{xx}—Eu2—Eu1^{xvii}	104.387 (9)
Sb2^{xxi}—Eu2—Eu1^{xvii}	173.179 (9)
Sb2^{vii}—Eu2—Eu1^{xvii}	129.306 (11)
Eu1^{iv}—Eu2—Eu1^{xvii}	93.682 (16)
Eu1^{xvi}—Eu2—Eu1^{xvii}	69.069 (12)
Eu1^{v}—Eu2—Eu1^{xvii}	54.653 (13)
Sb3^{ix}—Eu3—Sb3^{x}	88.85 (2)
Sb3^{ix}—Eu3—Sb2^{xi}	155.259 (10)
Sb3^{x}—Eu3—Sb2^{xi}	86.675 (12)
Sb3^{ix}—Eu3—Sb2^{x}	155.259 (10)
Sb3^{x}—Eu3—Sb2^{x}	86.675 (12)
Sb2^{xi}—Eu3—Sb2^{x}	48.601 (18)
Sb3^{ix}—Eu3—Sb2^{ix}	86.675 (12)
Sb3^{x}—Eu3—Sb2^{ix}	155.259 (10)
Sb2^{xi}—Eu3—Sb2^{ix}	106.94 (2)
Sb2^{x}—Eu3—Sb2^{ix}	87.283 (17)
Sb3^{ix}—Eu3—Sb2^{xii}	86.675 (12)
Sb3^{x}—Eu3—Sb2^{xii}	155.259 (10)
Sb2^{xi}—Eu3—Sb2^{xii}	87.283 (17)
Sb2^{x}—Eu3—Sb2^{xii}	106.94 (2)
Sb2^{ix}—Eu3—Sb2^{xii}	48.601 (18)
Sb3^{ix}—Eu3—Cd^{ix}	50.649 (11)
Sb3^{x}—Eu3—Cd^{ix}	108.724 (16)
Sb2^{xi}—Eu3—Cd^{ix}	152.666 (19)
Eu4^{x}—Sb2—Eu2^{x}	76.887 (8)
Eu3^{viii}—Sb2—Eu2^{x}	132.515 (16)
Eu3^{vii}—Sb2—Eu2^{x}	76.673 (13)
Sb2^{vi}—Sb2—Eu2^{ix}	66.952 (8)
Cd—Sb2—Eu2^{ix}	137.661 (10)
Eu4^{ix}—Sb2—Eu2^{ix}	76.887 (7)
Eu4^{x}—Sb2—Eu2^{ix}	136.289 (17)
Eu3^{viii}—Sb2—Eu2^{ix}	76.673 (14)
Eu3^{vii}—Sb2—Eu2^{ix}	132.515 (16)
Eu2^{x}—Sb2—Eu2^{ix}	82.083 (17)
Cd—Sb3—Cd^{vi}	111.30 (3)
Cd—Sb3—Eu1^{xvii}	76.384 (11)
Cd^{vi}—Sb3—Eu1^{xvii}	135.084 (7)
Cd—Sb3—Eu1^{iv}	135.084 (7)
Cd^{vi}—Sb3—Eu1^{iv}	76.384 (11)
Eu1^{xvii}—Sb3—Eu1^{iv}	130.47 (3)
Cd—Sb3—Eu1^{v}	135.084 (7)
Cd^{vi}—Sb3—Eu1^{v}	76.384 (12)
Eu1^{xvii}—Sb3—Eu1^{v}	69.701 (15)
Eu1^{iv}—Sb3—Eu1^{v}	89.770 (15)
Cd—Sb3—Eu1^{xvi}	76.384 (11)
Cd^{vi}—Sb3—Eu1^{xvi}	135.084 (7)
Eu1^{xvii}—Sb3—Eu1^{xvi}	89.770 (15)
Eu1^{iv}—Sb3—Eu1^{xvi}	69.701 (15)
Eu1^{v}—Sb3—Eu1^{xvi}	130.47 (3)
Cd—Sb3—Eu3^{vii}	66.237 (13)
Cd^{vi}—Sb3—Eu3^{vii}	66.236 (13)
Eu1^{xvii}—Sb3—Eu3^{vii}	142.479 (13)
Eu1^{iv}—Sb3—Eu3^{vii}	78.764 (10)
Eu1^{v}—Sb3—Eu3^{vii}	142.479 (13)
Eu1^{xvi}—Sb3—Eu3^{vii}	78.764 (10)
Cd—Sb3—Eu3^{viii}	66.237 (13)
Cd^{vi}—Sb3—Eu3^{viii}	66.236 (14)
Eu1^{xvii}—Sb3—Eu3^{viii}	78.764 (10)
Eu1^{iv}—Sb3—Eu3^{viii}	142.479 (13)
Eu1^{v}—Sb3—Eu3^{viii}	78.764 (10)
Eu1^{xvi}—Sb3—Eu3^{viii}	142.479 (13)
Eu3^{vii}—Sb3—Eu3^{viii}	88.86 (2)
Sb1^{xiii}—Cd—Sb1^{xiv}	111.92 (3)
Sb1^{xiii}—Cd—Sb3	111.885 (17)
Sb1^{xiv}—Cd—Sb3	111.885 (17)
Sb1^{xiii}—Cd—Sb2	108.095 (17)
Sb1^{xiv}—Cd—Sb2	108.095 (17)
Sb3—Cd—Sb2	104.55 (2)
Sb1^{xiii}—Cd—Eu3^{vii}	166.858 (18)
Sb1^{xiv}—Cd—Eu3^{vii}	80.981 (12)
Sb3—Cd—Eu3^{vii}	63.115 (14)
Sb2—Cd—Eu3^{vii}	63.735 (14)

Sb2^{x}—Eu3—Cd^{ix}	108.315 (13)
Sb2^{ix}—Eu3—Cd^{ix}	51.142 (13)
Sb2^{xii}—Eu3—Cd^{ix}	86.946 (12)
Sb3^{ix}—Eu3—Cd^{xi}	108.724 (17)
Sb3^{x}—Eu3—Cd^{xi}	50.649 (11)
Sb2^{xi}—Eu3—Cd^{xi}	51.142 (13)
Sb2^{x}—Eu3—Cd^{xi}	86.946 (12)
Sb2^{ix}—Eu3—Cd^{xi}	152.666 (19)
Sb2^{xii}—Eu3—Cd^{xi}	108.315 (14)
Cd^{ix}—Eu3—Cd^{xi}	154.68 (3)
Sb3^{ix}—Eu3—Cd^{xii}	50.649 (11)
Sb3^{x}—Eu3—Cd^{xii}	108.724 (17)
Sb2^{xi}—Eu3—Cd^{xii}	108.315 (13)
Sb2^{x}—Eu3—Cd^{xii}	152.666 (19)
Sb2^{ix}—Eu3—Cd^{xii}	86.946 (12)
Sb2^{xii}—Eu3—Cd^{xii}	51.142 (13)
Cd^{ix}—Eu3—Cd^{xii}	88.461 (16)
Cd^{xi}—Eu3—Cd^{xii}	86.030 (15)
Sb3^{ix}—Eu3—Cd^{x}	108.724 (16)
Sb3^{x}—Eu3—Cd^{x}	50.649 (11)
Sb2^{xi}—Eu3—Cd^{x}	86.946 (12)
Sb2^{x}—Eu3—Cd^{x}	51.142 (13)
Sb2^{ix}—Eu3—Cd^{x}	108.315 (13)
Sb2^{xii}—Eu3—Cd^{x}	152.666 (19)
Cd^{ix}—Eu3—Cd^{x}	86.030 (15)
Cd^{xi}—Eu3—Cd^{x}	88.461 (16)
Cd^{xii}—Eu3—Cd^{x}	154.68 (3)
Sb3^{ix}—Eu3—Eu4^{xxii}	111.194 (5)
Sb3^{x}—Eu3—Eu4^{xxii}	111.194 (5)
Sb2^{xi}—Eu3—Eu4^{xxii}	48.986 (9)
Sb2^{x}—Eu3—Eu4^{xxii}	93.069 (14)
Sb2^{ix}—Eu3—Eu4^{xxii}	93.069 (14)
Sb2^{xii}—Eu3—Eu4^{xxii}	48.986 (8)
Cd^{ix}—Eu3—Eu4^{xxii}	135.440 (10)
Cd^{xi}—Eu3—Eu4^{xxii}	60.620 (10)
Cd^{xii}—Eu3—Eu4^{xxii}	60.620 (10)
Cd^{x}—Eu3—Eu4^{xxii}	135.440 (10)
Sb3^{ix}—Eu3—Eu4^{xxiii}	111.194 (5)
Sb3^{x}—Eu3—Eu4^{xxiii}	111.194 (5)
Sb2^{xi}—Eu3—Eu4^{xxiii}	93.069 (14)
Sb2^{x}—Eu3—Eu4^{xxiii}	48.986 (8)
Sb2^{ix}—Eu3—Eu4^{xxiii}	48.986 (8)
Sb2^{xii}—Eu3—Eu4^{xxiii}	93.069 (14)
Cd^{ix}—Eu3—Eu4^{xxiii}	60.620 (10)
Cd^{xi}—Eu3—Eu4^{xxiii}	135.440 (10)
Cd^{xii}—Eu3—Eu4^{xxiii}	135.440 (10)
Cd^{x}—Eu3—Eu4^{xxiii}	60.620 (10)
Eu4^{xxii}—Eu3—Eu4^{xxiii}	119.173 (14)
Sb1^{xiii}—Cd—Eu3^{viii}	80.981 (12)
Sb1^{xiv}—Cd—Eu3^{viii}	166.858 (18)
Sb3—Cd—Eu3^{viii}	63.115 (14)
Sb2—Cd—Eu3^{viii}	63.735 (14)
Eu3^{vii}—Cd—Eu3^{viii}	86.030 (15)
Sb1^{xiii}—Cd—Eu1^{vi}	58.674 (13)
Sb1^{xiv}—Cd—Eu1^{vi}	58.674 (13)
Sb3—Cd—Eu1^{vi}	109.99 (2)
Sb2—Cd—Eu1^{vi}	145.46 (2)
Eu3^{vii}—Cd—Eu1^{vi}	133.990 (11)
Eu3^{viii}—Cd—Eu1^{vi}	133.990 (11)
Sb1^{xiii}—Cd—Eu1^{xvii}	57.443 (13)
Sb1^{xiv}—Cd—Eu1^{xvii}	117.87 (2)
Sb3—Cd—Eu1^{xvii}	56.693 (13)
Sb2—Cd—Eu1^{xvii}	133.962 (13)
Eu3^{vii}—Cd—Eu1^{xvii}	119.724 (18)
Eu3^{viii}—Cd—Eu1^{xvii}	70.603 (12)
Eu1^{vi}—Cd—Eu1^{xvii}	69.370 (13)
Sb1^{xiii}—Cd—Eu1^{xvi}	117.87 (2)
Sb1^{xiv}—Cd—Eu1^{xvi}	57.443 (13)
Sb3—Cd—Eu1^{xvi}	56.693 (13)
Sb2—Cd—Eu1^{xvi}	133.962 (13)
Eu3^{vii}—Cd—Eu1^{xvi}	70.603 (12)
Eu3^{viii}—Cd—Eu1^{xvi}	119.724 (18)
Eu1^{vi}—Cd—Eu1^{xvi}	69.370 (13)
Eu1^{xvii}—Cd—Eu1^{xvi}	74.720 (15)
Sb1^{xiii}—Cd—Eu4^{x}	115.04 (2)
Sb1^{xiv}—Cd—Eu4^{x}	55.378 (13)
Sb3—Cd—Eu4^{x}	132.546 (13)
Sb2—Cd—Eu4^{x}	54.120 (12)
Eu3^{vii}—Cd—Eu4^{x}	69.550 (10)
Eu3^{viii}—Cd—Eu4^{x}	117.827 (18)
Eu1^{vi}—Cd—Eu4^{x}	99.961 (13)
Eu1^{xvii}—Cd—Eu4^{x}	168.941 (17)
Eu1^{xvi}—Cd—Eu4^{x}	104.797 (9)
Sb1^{xiii}—Cd—Eu4^{ix}	55.378 (13)
Sb1^{xiv}—Cd—Eu4^{ix}	115.04 (2)
Sb3—Cd—Eu4^{ix}	132.546 (13)
Sb2—Cd—Eu4^{ix}	54.120 (12)
Eu3^{vii}—Cd—Eu4^{ix}	117.827 (18)
Eu3^{viii}—Cd—Eu4^{ix}	69.550 (10)
Eu1^{vi}—Cd—Eu4^{ix}	99.961 (13)
Eu1^{xvii}—Cd—Eu4^{ix}	104.797 (9)
Eu1^{xvi}—Cd—Eu4^{ix}	168.941 (17)
Eu4^{x}—Cd—Eu4^{ix}	73.485 (12)
Eu1^{i}—O—Eu1^{xviii}	97.9 (2)
Eu1^{i}—O—Eu2^{ix}	107.12 (4)
Eu1^{xviii}—O—Eu2^{ix}	107.12 (4)

Sb2^{xiii}—Eu4—Sb2^{vii}	180.00 (2)	Eu1^{i}—O—Eu2^{x}	107.12 (4)
Sb2^{xiii}—Eu4—Sb2^{xiv}	92.638 (15)	Eu1^{xviii}—O—Eu2^{x}	107.12 (4)
Sb2^{vii}—Eu4—Sb2^{xiv}	87.362 (15)	Eu2^{ix}—O—Eu2^{x}	126.7 (2)

Symmetry codes: (i) $-x, -y+1, -z+1$; (ii) $-x+1/2, -y+1/2, z+1/2$; (iii) $-x-1/2, -y+1/2, z+1/2$; (iv) $-x+1/2, -y+1/2, -z+1$; (v) $-x-1/2, -y+1/2, -z+1$; (vi) $x, y, -z+1/2$; (vii) $x+1/2, y-1/2, z$; (viii) $x-1/2, y-1/2, z$; (ix) $x-1/2, y+1/2, z$; (x) $x+1/2, y+1/2, z$; (xi) $x+1/2, y+1/2, -z+1/2$; (xii) $x-1/2, y+1/2, -z+1/2$; (xiii) $-x-1/2, -y+1/2, -z$; (xiv) $-x+1/2, -y+1/2, -z$; (xv) $-x, -y, -z$; (xvi) $-x+1/2, -y+1/2, z-1/2$; (xvii) $-x-1/2, -y+1/2, z-1/2$; (xviii) $-x, -y+1, z-1/2$; (xix) $x, y, -z+3/2$; (xx) $x-1/2, y-1/2, -z+1/2$; (xxi) $x+1/2, y-1/2, -z+1/2$; (xxii) $-x, -y+1, z+1/2$; (xxiii) $x, y+1, z$; (xxiv) $x, y-1, z$; (xxv) $-x, -y+1, -z$.