

## Octarubidium di- $\mu$ -sulfato- $\kappa^4$ O:O'-bis-[cis-dioxido-cis-disulfatotungstate(VI)]

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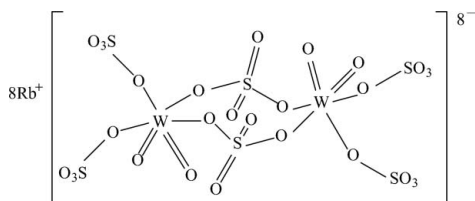
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 Key indicators: single-crystal X-ray study;  $T = 120$  K; mean  $\sigma(\text{S-O}) = 0.003$  Å;  $R$  factor = 0.020;  $wR$  factor = 0.052; data-to-parameter ratio = 17.5.

The title compound,  $\text{Rb}_8[\text{W}_2\text{O}_4(\text{SO}_4)_6]$ , was precipitated from a melt of tungsten(VI) oxide and rubidium sulfate in rubidium disulfate. The unit cell contains two discrete  $[\{\text{W}^{\text{VI}}\text{O}_2(\text{SO}_4)_2\}_2(\mu\text{-SO}_4)_2]^{8-}$  units connected by Rb–O coordination. The W atom is octahedrally surrounded by two oxide ligands, two terminal sulfate ligands and two bridging sulfate groups. One Rb atom is coordinated by eight O atoms, whereas the three other Rb atoms are coordinated by nine O atoms from sulfate and oxide groups, leading to distorted  $[\text{RbO}_x]$  polyhedra.

### Related literature

For methods used in the synthesis, see: Berg *et al.* (2006); Borup *et al.* (1990); Nørbygaard *et al.* (1998). For the crystal structure of the potassium analog, see: Schäffer & Berg (2005).



### Experimental

#### Crystal data

$\text{Rb}_8[\text{W}_2\text{O}_4(\text{SO}_4)_6]$   
 $M_r = 1691.86$   
 Monoclinic,  $P2_1/n$   
 $a = 9.6405$  (5) Å  
 $b = 13.9890$  (7) Å  
 $c = 10.7692$  (5) Å  
 $\beta = 90.472$  (1)°

$V = 1452.30$  (12) Å<sup>3</sup>  
 $Z = 2$   
 Mo  $K\alpha$  radiation  
 $\mu = 21.77$  mm<sup>-1</sup>  
 $T = 120$  K  
 $0.45 \times 0.20 \times 0.05$  mm

#### Data collection

Bruker SMART APEX diffractometer

Absorption correction: multi-scan (SADABS; Sheldrick, 2002)  
 $T_{\min} = 0.077$ ,  $T_{\max} = 0.59$

18895 measured reflections  
 3496 independent reflections

3360 reflections with  $I > 2\sigma(I)$   
 $R_{\text{int}} = 0.036$

#### Refinement

$R[F^2 > 2\sigma(F^2)] = 0.020$   
 $wR(F^2) = 0.052$   
 $S = 1.11$   
 3496 reflections

200 parameters  
 $\Delta\rho_{\text{max}} = 1.35$  e Å<sup>-3</sup>  
 $\Delta\rho_{\text{min}} = -1.51$  e Å<sup>-3</sup>

**Table 1**

Selected bond lengths (Å).

W1—O1	1.716 (2)	Rb3—O12 <sup>i</sup>	3.101 (2)
W1—O2	1.721 (2)	Rb3—O11 <sup>vii</sup>	3.170 (2)
W1—O3	1.960 (2)	Rb3—O12 <sup>v</sup>	3.173 (3)
W1—O4	2.009 (2)	Rb3—O1	3.220 (2)
W1—O5	2.097 (2)	Rb3—O13 <sup>v</sup>	3.225 (3)
W1—O6	2.254 (2)	Rb4—O8 <sup>viii</sup>	2.910 (3)
Rb1—O1	2.877 (2)	Rb4—O3 <sup>i</sup>	2.914 (2)
Rb1—O8	2.931 (2)	Rb4—O10	2.941 (3)
Rb1—O7	2.939 (3)	Rb4—O14	2.964 (2)
Rb1—O9 <sup>j</sup>	2.955 (3)	Rb4—O13 <sup>i</sup>	2.981 (3)
Rb1—O6 <sup>ii</sup>	3.009 (2)	Rb4—O12 <sup>i</sup>	3.103 (3)
Rb1—O11 <sup>iii</sup>	3.010 (2)	Rb4—O6 <sup>i</sup>	3.221 (2)
Rb1—O2 <sup>iii</sup>	3.084 (2)	Rb4—O5	3.253 (2)
Rb1—O5 <sup>ii</sup>	3.185 (2)	Rb4—O4	3.423 (2)
Rb2—O14 <sup>iv</sup>	2.761 (3)	S1—O11	1.445 (2)
Rb2—O7 <sup>v</sup>	2.893 (2)	S1—O14	1.449 (2)
Rb2—O9 <sup>vi</sup>	2.903 (3)	S1—O6 <sup>ix</sup>	1.490 (2)
Rb2—O2	2.939 (3)	S1—O4	1.531 (2)
Rb2—O13 <sup>ii</sup>	2.986 (2)	S2—O12	1.451 (3)
Rb2—O8	3.082 (3)	S2—O9	1.452 (3)
Rb2—O10 <sup>v</sup>	3.106 (3)	S2—O8	1.454 (3)
Rb2—O9	3.337 (3)	S2—O3	1.575 (2)
Rb2—O1	3.374 (3)	S3—O13	1.461 (2)
Rb3—O11	2.776 (2)	S3—O7	1.464 (3)
Rb3—O10 <sup>ii</sup>	2.788 (3)	S3—O10	1.464 (3)
Rb3—O7 <sup>v</sup>	2.874 (2)	S3—O5	1.528 (2)
Rb3—O14 <sup>vii</sup>	2.935 (2)		

Symmetry codes: (i)  $x - \frac{1}{2}, -y + \frac{1}{2}, z - \frac{1}{2}$ ; (ii)  $x + \frac{1}{2}, -y + \frac{1}{2}, z - \frac{1}{2}$ ; (iii)  $-x + \frac{1}{2}, y + \frac{1}{2}, -z + \frac{3}{2}$ ; (iv)  $x + 1, y, z$ ; (v)  $-x + \frac{1}{2}, y - \frac{1}{2}, -z + \frac{3}{2}$ ; (vi)  $-x + 1, -y, -z + 2$ ; (vii)  $-x, -y, -z + 1$ ; (viii)  $x - 1, y, z$ ; (ix)  $-x, -y, -z + 2$ .

Data collection: SMART (Bruker, 2002); cell refinement: SAINT-Plus (Bruker, 2002); data reduction: SAINT-Plus; program(s) used to solve structure: SHELXTL (Sheldrick, 2008); program(s) used to refine structure: SHELXTL; molecular graphics: ORTEP-3 (Farrugia, 1997) and ATOMS (Dowty, 2000); 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: FI2090).

### References

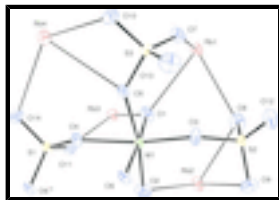
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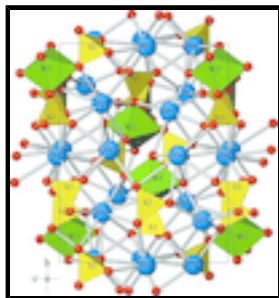
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