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**A Facile Route for the Synthesis of Polycationic Tellurium  
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## Full Paper

# A Facile Route for the Synthesis of Polycationic Tellurium Cluster Compounds: Synthesis in Ionic Liquid Media and Characterization by Single-Crystal X-Ray Crystallography and Magnetic Susceptibility

Ejaz Ahmed,<sup>[a]</sup> Eike Ahrens,<sup>[a]</sup> Martin Heise,<sup>[a]</sup> and Michael Ruck\*<sup>[a]</sup>

**Keywords:** Tellurium; Polycations; Cluster compounds; Ionic Liquids; Magnetic properties

**Abstract.** An innovative soft chemical approach has been applied, using ionic liquids as an alternative reaction medium for the synthesis of tellurium polycationic cluster compounds at room temperature.  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$ ,  $\text{Te}_6[\text{WOCl}_4]_2$ , and  $\text{Te}_4[\text{AlCl}_4]_2$  have been isolated from the ionic liquid  $[\text{BMIM}]\text{Cl}/\text{AlCl}_3$  ( $[\text{BMIM}]^+$ : 1-*n*-butyl-3-methylimidazolium) and characterized. Black, cube-shaped crystals of  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$ , which is not accessible by conventional chemical transport reaction, are obtained by reacting the elements at room temperature in  $[\text{BMIM}]\text{Cl}/\text{AlCl}_3$ . The monoclinic structure ( $P2_1/n$ ,  $a = 1138.92(2)$  pm,  $b = 1628.13(2)$  pm,  $c = 1611.05(2)$  pm,  $\beta = 105.88(1)^\circ$ ) is homeotypic to the triclinic bromide

$[\text{Mo}_2\text{Te}_{12}]\text{Br}_6$ . In the binuclear complex  $[\text{Mo}_2\text{Te}_{12}]^{6+}$ , the molybdenum(III) atoms are  $\eta^4$ -coordinated by terminal  $\text{Te}_4^{2+}$  rings and two bridging  $\eta^2$ - $\text{Te}_2^{2-}$  dumbbells. Despite the short Mo...Mo distance of 297.16(5) pm, coupling of the magnetic moments is not observed. The paramagnetic moment of 3.53  $\mu_B$  per molybdenum(III) atom corresponds to an electron count of seventeen. Black crystals of monoclinic  $\text{Te}_6[\text{WOCl}_4]_2$  are obtained by the oxidation of tellurium with  $\text{WOCl}_4$  in  $[\text{BMIM}]\text{Cl}/\text{AlCl}_3$ . Tellurium and tellurium(IV) synproportionate in the ionic liquid at room temperature yielding violet crystals of orthorhombic  $\text{Te}_4[\text{AlCl}_4]_2$ .

## Introduction

The formation of polycationic clusters in Lewis acid is a well-known feature of tellurium chemistry.  $\text{Te}_4^{2+}$ ,  $\text{Te}_6^{4+}$ ,  $\text{Te}_6^{2+}$ ,  $\text{Te}_8^{2+}$ ,  $\text{Te}_7^{2+}$ , and  $\text{Te}_{10}^{2+}$  have been structurally characterized [1]. There are three different routes for the synthesis of tellurium polycationic clusters in literature: The classical route, performed by Gillespie and co-workers, is the oxidation of tellurium by  $\text{AsF}_5$  or  $\text{SbF}_5$  in liquid  $\text{SO}_2$  using a temperature range from  $-196^\circ\text{C}$  to  $25^\circ\text{C}$  [2]. High temperature synthesis was carried out by Corbett *et al.* [3] and Beck *et al.* [1]. Kloo and co-workers introduced the first room temperature synthesis using  $\text{GaX}_3$ -benzene media ( $X = \text{Br}, \text{Cl}$ ) [4].

Recently, we have reported a new room temperature route for the synthesis of bismuth polycationic clusters from ionic liquids and anticipated that this approach can be extended to other elements of the periodic table, e.g. tellurium [5].

The key factors of this new synthetic route are:

- i) Very high solubility of the elements (Bi, Te, Sb, Se, Ga, In) and their halogenides at room temperature allow reactions under mild conditions involving one-pot synthesis.
- ii) Low temperature synthesis eliminates the risk of product decomposition.
- iii) Easier reproducibility of the products.
- iv) Controllable parameters, such as solvent acidity, oxidizing/reducing agent, or halide acceptor, allow modifying the synthesis with the objective to crystallize different products.

The application of this approach in order to synthesize tellurium cluster compounds at room temperature resulted in the isolation of  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$ ,  $\text{Te}_4[\text{AlCl}_4]_2$ , and  $\text{Te}_6[\text{WOCl}_4]_2$ .

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## Results and Discussions

### Synthesis and Structure of $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$

$[\text{Mo}_2\text{Te}_{12}]\text{I}_6$  is homeotypic to  $[\text{Mo}_2\text{Te}_{12}]\text{Br}_6$  containing a heteropolycationic  $[\text{Mo}_2\text{Te}_{12}]^{6+}$  cluster.  $[\text{Mo}_2\text{Te}_{12}]\text{Br}_6$  was synthesized by Beck through chemical vapor transport (CVT) [6a]. He used a temperature gradient of 340 °C to 270 °C to get single-crystals of  $[\text{Mo}_2\text{Te}_{12}]\text{Br}_6$  within four weeks. Despite many attempts, the CVT synthesis of the analogous iodide failed [7]. In our studies,  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$  was obtained by reacting Mo, Te and  $\text{I}_2$  in the Lewis acidic ionic liquid  $[\text{BMIM}]\text{Cl}/\text{AlCl}_3$  at room temperature to give a dark solution within minutes. After overnight stirring and a crystallization period of only three days, single-crystals could be isolated with a yield of 35 %.

The monoclinic cell (space group  $P2_1/n$ ) contains four formula units. The cationic complex  $[\text{Mo}_2\text{Te}_{12}]^{6+}$  has a pair of molybdenum atoms, which are connected by two bridging  $\eta^2\text{-Te}_2^{2-}$  groups (Figure 1). In addition, each molybdenum atom is coordinated by a terminal polycationic  $\text{Te}_4^{2+}$  ligand in  $\eta^4$  mode. As a result, both molybdenum atoms are in square-antiprismatic environment.

**Figure 1.**  $[\text{Mo}_2\text{Te}_{12}]^{6+}$  complex cation. The ellipsoids represent 95 % probability at 150(2) K.

The point symmetry of the  $[\text{Mo}_2\text{Te}_{12}]^{6+}$  complex in both compounds, i.e. in monoclinic  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$  and in triclinic  $[\text{Mo}_2\text{Te}_{12}]\text{Br}_6$ , is close to  $D_{2h}$  ( $mmm$ ), although the site symmetry of the cluster is  $C_i$  in the bromide and  $C_s$  in the iodide. Moreover, there is only one independent complex present in the unit cell of  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$  whereas two independent complexes are found in  $[\text{Mo}_2\text{Te}_{12}]\text{Br}_6$ .

The distances between molybdenum and tellurium atoms of the  $\text{Te}_2^{2-}$  groups are slightly shorter (272.35(4) pm to 274.41(4) pm) than those between molybdenum and tellurium atoms of the  $\text{Te}_4^{2+}$  rings (278.99(5) pm to 285.38(4) pm). The  $\text{Te}_4^{2+}$  rings show significant distortion (distances: 276.12(5) pm to 286.85(4) pm, angles: 87.19(1) ° to 92.61(1) °) from  $D_{4h}$  to butterfly conformation with dihedral angles 5.3 ° and 5.9 ° (Table 1).

The complexes  $[(\text{Mo}^{3+})_2(\text{Te}_2^{2-})_2(\text{Te}_4^{2+})_2]^{6+}$  are surrounded by iodide ions, which connect them

into layers (Figure 2). The shortest distance between an iodide ion and an atom of the  $\text{Te}_4^{2+}$  rings is 302.20(4) pm.

**Figure 2.** Section of the crystal structure of  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$ . The ellipsoids represent 95 % probability at 150(2) K.

$[\text{Mo}_2\text{Te}_{12}]\text{I}_6$  is paramagnetic with Weiss temperature  $\theta = +5.8$  K (Figure 3). An analysis based on the Curie-Weiss law gives a paramagnetic effective moment of 3.53  $\mu_B$  per molybdenum atom, which is slightly lower than the spin-only value of 3.87  $\mu_B$  for a  $d^3$  configuration. In low fields some traces of ferromagnetism are found but these are very weak and most probably due to minor impurity phases.

The absence of intramolecular coupling of the magnetic cations in  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$  is astonishing, since the short distance of 297.16(5) pm between the molybdenum(III) atoms suggests a chemical bond. In the present case the complex is a diradical with seventeen electrons per central atom. The electron counting scheme adds up the three valence electrons of a molybdenum(III) atom, six electrons of the  $\pi$ -system of the  $\text{Te}_4^{2+}$  ring, and four electrons (two lone-pairs) of each  $\text{Te}_2^{2-}$  group ( $3 + 6 + 4 \cdot 2 = 17$ ).

In contrast, the closely related *catena*-compound  $\text{MoTe}_4\text{Br} = [(\text{Mo}^{3+})_2(\text{Te}_2^{2-})_2(\text{Te}_2\text{Br}^-)_2]$  with a Mo–Mo bond length of 300.5(2) pm shows only weak, nearly temperature-independent paramagnetism with a magnetic moment of 0.4  $\mu_B$  at 310 K, indicating a strong coupling and an eighteen electron situation [6a].

**Figure 3.** Temperature dependence of reciprocal molar susceptibility for  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$  in a magnetic field of  $H = 35$  kOe.

### Synthesis and Structure of $\text{Te}_4[\text{AlCl}_4]_2$

$\text{Te}_4[\text{AlCl}_4]_2$  was reported by Corbett and co-workers through synproportionation at 250 °C [3]. Contrary to higher temperature method, we obtained  $\text{Te}_4[\text{AlCl}_4]_2$  by reacting Te and  $\text{TeCl}_4$  in the Lewis acidic ionic liquid  $[\text{BMIM}]\text{Cl}/\text{AlCl}_3$  at room temperature. Addition of a small amount of

1  
2 anhydrous NaCl is helpful for getting single  
3 crystals in two days (66 % yield). The  
4 orthorhombic compound contains planar  $\text{Te}_4^{2+}$   
5 polycations and tetrahedral  $\text{AlCl}_4^-$  anions. The  
6 atomic coordinates agree within three standard  
7 deviations with those published earlier [3].  
8  
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### 10 11 *Synthesis and Structure of $\text{Te}_6[\text{WOCl}_4]_2$*

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13  
14 Crystals of  $\text{Te}_6[\text{WOCl}_4]_2$  have previously been  
15 synthesized within two weeks using CVT in the  
16 temperature gradient of 230 °C to 210 °C [6b]. We  
17 carried out the oxidation of elemental tellurium  
18 with  $\text{WOCl}_4$  in ionic liquids at room temperature.  
19 Addition of anhydrous NaCl to the dark coloured  
20 filtrate resulted in precipitation of black crystals in  
21 three days (yield: 39 %).  
22

23 The crystal structure consists of boat shaped  
24  $\text{Te}_6^{2+}$  polycations and one-dimensional square-  
25 pyramidal  $\text{WOCl}_4^-$  anions. The atomic coordinates  
26 agree within six standard deviations with those  
27 published by Beck [6b].  
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### 32 **Conclusion**

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34 We have developed an ionic-liquid-based  
35 room-temperature synthesis of homo- and  
36 heteropolyatomic cluster compounds. The  
37 significance of the present study is manifold. The  
38 redox reactions in ionic liquids provide an  
39 efficient, one-step route to the inorganic clusters.  
40 Salting out is quite helpful technique to get single  
41 crystals in few days. The additional advantages of  
42 this synthetic route are:  
43

- 44 i) Inclusion of the organic cation has not  
45 been observed yet.
- 46 ii) Ionic liquids render stability to the ionic  
47 intermediates [5].
- 48 iii) Reactions are faster and there is no need  
49 to wait for weeks as in chemical vapor  
50 transport (CVT). Crystal growth  
51 requires only few days, and the yields  
52 can be rather high.
- 53 iv) Moreover, ionic liquids are regarded as  
54 economical and environmental friendly  
55 solvents. They could be alternatives to  
56 cancer causing organic solvents [8].  
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60 These features make the soft chemical procedure a  
versatile and general route towards the synthesis of  
other innovative materials.

### **Experimental Section**

**Chemicals:** Starting materials were commercial 1-methylimidazole (Merck, 99 %), 1-chlorobutane (Merck, 98.5 %),  $\text{AlCl}_3$  (Fluka, anhydrous, 98%), Te (Aldrich, 99.999 %),  $\text{WOCl}_4$  (Aldrich, 98 %), Mo (Aldrich, 99.95 %),  $\text{I}_2$  (Grüssing, 99.5 %), and  $\text{Cl}_2$  (Air Liquide, 99.8 %).  $\text{TeCl}_4$  was synthesized from the elements [9].  $\text{AlCl}_3$  was sublimated three times.  $\text{I}_2$  was sublimated twice over BaO. Organic reagents were distilled before use. Because of the high moisture sensitivity of the anhydrous metal halides used in this work, all manipulations were performed under dry argon (99.999 %) atmosphere in standard Schlenk tubes.

**Synthesis of  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$ :** The ionic liquid  $[\text{BMIM}]\text{Cl}/\text{AlCl}_3$  ( $[\text{BMIM}]^+$ : 1-*n*-butyl-3-methylimidazolium) were prepared according to a literature procedure [10]. The starting materials were added together in the Lewis acidic  $[\text{BMIM}]\text{Cl}/\text{AlCl}_3$  ionic liquid (molar ratio = 1:1.3, volume = 1.5 ml) having molar ratio of Mo:Te:I = 1:6:3 (total mass = 355 mg). The reaction mixture was left for stirring overnight at room temperature. After three days, black, cube-shaped crystals were obtained. Yield: 35 %. The energy-dispersive X-ray (EDX) analysis of a single crystal gave the atomic ratio Mo:Te:I = 10:55:35 (expected = 10:60:30). EDX is only a semiquantitative technique, which sometimes cannot give exact estimation for two closely related elements.

**Synthesis of  $\text{Te}_4[\text{AlCl}_4]_2$ :** The stoichiometric amount of Te and  $\text{TeCl}_4$  (total mass = 260 mg) were added to the Lewis acidic  $[\text{BMIM}]\text{Cl}/\text{AlCl}_3$  (molar ratio = 1:1.3, volume = 1.5 ml) ionic liquid. The reaction mixture was left for stirring overnight at room temperature then filtered to separate unreacted material. Addition of a small amount of anhydrous NaCl into the dark violet filtrate led to the precipitation of violet, column-like crystals in two days. Yield: 66 %. EDX: Te:Al:Cl = 27:15:58 (expected = 29:14:57).

**Synthesis of  $\text{Te}_6[\text{WOCl}_4]_2$ :** The same procedure was used as described for  $\text{Te}_4[\text{AlCl}_4]_2$ , starting from Te and  $\text{WOCl}_4$  (total mass = 288 mg). After three days, black, irregular shaped crystals were obtained. Yield: 39 %. Because of the high moisture sensitivity of  $\text{Te}_6[\text{WOCl}_4]_2$ , it was not yet possible to carry out EDX analysis.



**X-Ray Crystallography:** Since all compounds are sensitive towards hydrolysis by moist air, crystals were selected in a glove box (concentration of  $O_2 < 0.1$  ppm and  $H_2O < 0.1$  ppm) and filled in glass capillaries of 0.2 mm diameter, which were sealed by a hot filament in the argon atmosphere. Intensity data of a single-crystal of  $[Mo_2Te_{12}]I_6$  were recorded using a Bruker Kappa CCD diffractometer and graphite-monochromatized Mo- $K\alpha$  radiation ( $\lambda = 71.073$  pm) at 150 K. Data sets of single-crystals of  $Te_4[AlCl_4]_2$  and  $Te_6[WOCl_4]_2$  were collected on an imaging-plate diffraction system IPDS-I (Stoe) using graphite-monochromatized Mo- $K\alpha$  radiation at room temperature. The raw data were corrected for background, polarization and the Lorentz factor. The microscopic description of the crystal shapes, which was later used in the numerical absorption corrections [11], was optimized using sets of reflections that are equivalent in the monoclinic Laue class for  $[Mo_2Te_{12}]I_6$  and  $Te_6[WOCl_4]_2$ , orthorhombic for  $Te_4[AlCl_4]_2$  [12]. The structures were solved with direct methods and refined using *SHELX97* [13]. After refinement of the structure model of  $[Mo_2Te_{12}]I_6$ , we found a residual electron density of  $+5.08 \text{ e} \cdot 10^{-6} \text{ pm}^{-3}$  which can be interpreted as a second orientation of the  $Te_4^{2+}$  rings with weight of a few percents. This disorder could not be refined neither in a split atom model nor in a twin model. Slow cooling of the crystals did not lead to ordering. Graphics of the structures were developed using the program Diamond 3.2e [14]. The results of the structure determinations are summarized in Tables 2 and 3. Further crystal structure data have been deposited at the Fachinformationszentrum Karlsruhe, D-76344 Eggenstein-Leopoldshafen, Germany (Fax: +49-7247-808-666, E-Mail: [crysdata@fiz-karlsruhe.de](mailto:crysdata@fiz-karlsruhe.de)). Inquiries should be accompanied by the depository number CSD-421881 ( $[Mo_2Te_{12}]I_6$ ), CSD-421883 ( $Te_4[AlCl_4]_2$ ), and CSD-421882 ( $Te_6[WOCl_4]_2$ ).

**Magnetic Susceptibility Measurements:** The magnetic susceptibility of  $[Mo_2Te_{12}]I_6$  was measured with a SQUID magnetometer (MPMS-XL7, Quantum Design) between 1.8 K and 400 K of a 50 mg sample in four different magnetic fields between 0.10 and 70 kOe.

**Supporting information:** Structural parameters for  $Te_4[AlCl_4]_2$  and  $Te_6[WOCl_4]_2$ , as well as data of the temperature dependence of the reciprocal

molar susceptibility for  $[Mo_2Te_{12}]I_6$  in different magnetic fields are available on internet <http://dx.doi.org/10.1002/zaac>.

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**Table 1.** Selected interatomic distances (pm) in  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$ .

atoms	distance	atoms	distance	
Te1– Te2	286.85(4)	Te7– Te8	276.81(4)	
	Te4	276.97(4)	Mo1	272.73(4)
	Mo1	284.54(4)	Mo2	273.71(4)
Te2– Te3	276.93(4)	Te8– Mo1	273.10(4)	
	Mo1	280.18(4)	Mo2	273.49(4)
	I2	302.20(4)	Te9– Te10	283.07(5)
Te3– Te4	280.66(4)	Te12	276.12(5)	
	Mo1	284.54(4)	Mo2	285.38(4)
Te4– Mo1	280.24(4)	Te10– Te11	276.91(5)	
Te5– Te6	276.71(4)	Mo2	279.97(5)	
	Mo1	274.05(4)	I6	314.77(5)
	Mo2	274.41(4)	Te11– Te12	281.18(5)
Te6– Mo1	273.22(4)	Mo2	284.43(5)	
	Mo2	272.35(4)	Te12– Mo2	278.99(5)
		Mo1– Mo2	297.16(5)	

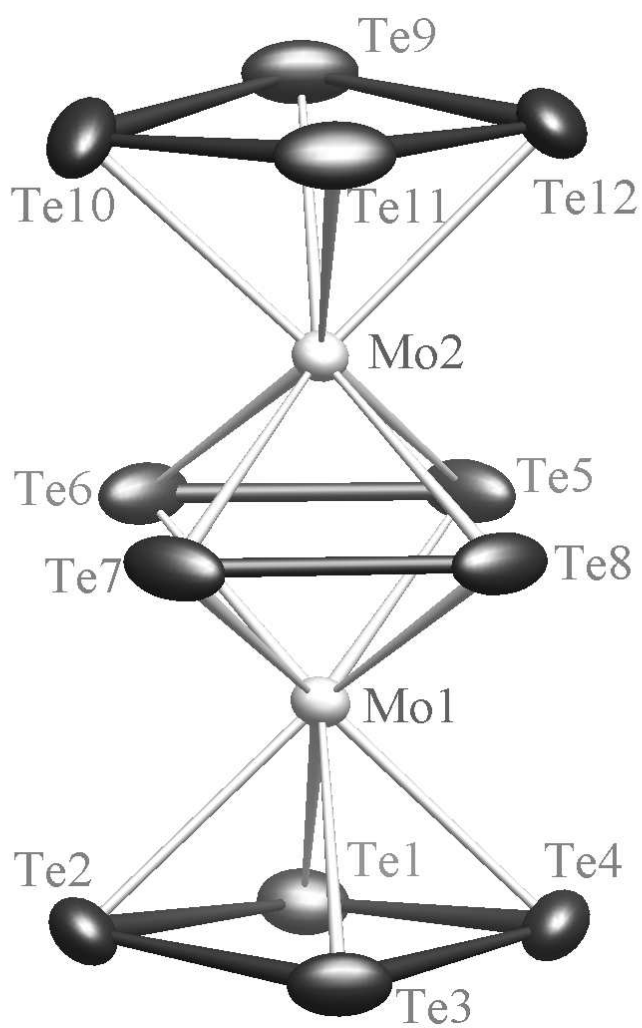
**Table 2.** Crystallographic data and details of the structure determinations for  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$ ,  $\text{Te}_4[\text{AlCl}_4]_2$ , and  $\text{Te}_6[\text{WOCl}_4]_2$ .

Compound	$[\text{Mo}_2\text{Te}_{12}]\text{I}_6$	$\text{Te}_4[\text{AlCl}_4]_2$	$\text{Te}_6[\text{WOCl}_4]_2$
Crystal system	monoclinic	orthorhombic	monoclinic
Space group	$P2_1/n$	$Pbca$	$P2_1/c$
Temperature (K)	150(2)	293(2)	293(2)
$a, b, c$ (pm), $\beta$ ( $^\circ$ )	1138.92(2), 1628.13(2), 1611.05(2), 105.88(1)	1072.1(1), 1412.8(1), 1183.2(2), 90	917.07(8), 1631.9(2), 3077.5(3), 117.008(7)
$V$ ( $10^6 \text{ pm}^3$ )	2873.42(7)	1792.1(4)	4103.4(7)
Formula units per cell	4	4	8
Calculated density ( $\text{g}\cdot\text{cm}^{-3}$ )	5.74	3.14	4.69
Measurement device	CCD Kappa (Bruker)	imaging plate diffractometer (IPDS-I, Stoe)	
Radiation	graphite-monochromated Mo- $K\alpha$ radiation ( $\lambda = 71.073 \text{ pm}$ )		
Measurement range	$-17 \leq h \leq 17$ $-27 \leq k \leq 26$ $-27 \leq l \leq 26$	$-11 \leq h \leq 11$ $-14 \leq k \leq 14$ $-12 \leq l \leq 12$	$-9 \leq h \leq 9$ $-18 \leq k \leq 18$ $-34 \leq l \leq 34$
$\mu(\text{Mo-}K\alpha)$ ( $\text{mm}^{-1}$ )	19.25	7.70	20.60
Measured reflections	72507	8267	23195
Unique reflections $F_o > 4\sigma(F_o)$	13529, 9970	1106, 868	5789, 3911
$R(\text{int}), R(\sigma)$	0.041, 0.039	0.079, 0.038	0.086, 0.066
$R_I [F_o > 4\sigma(F_o)]$	0.035	0.033	0.063
$R_I$ (all $F_o$ )	0.060	0.050	0.103
$wR_2$ (all $F_o^2$ )	0.060	0.066	0.070
No. of parameters	182	64	305
Goodness of fit	1.27	1.20	1.27
$\Delta\rho(\text{max, min})$ ( $\text{e}\cdot 10^{-6} \text{ pm}^{-3}$ )	+5.08, -4.31	+0.86, -0.76	+1.33, -1.23



**Table 3.** Coordinates and equivalent isotropic displacement parameters for  $[\text{Mo}_2\text{Te}_{12}]_6$  at 150(2) K. All atoms occupy Wyckoff positions  $4e$ .  $U_{\text{eq}}$  is defined as one third of the trace of the orthogonalized  $U_{ij}$  tensor.

Atom	$x$	$y$	$z$	$U_{\text{eq}}/\text{pm}^2$
Te1	0.31709(3)	0.37043(2)	0.17595(2)	131.6(6)
Te2	0.36271(3)	0.38843(2)	0.35915(2)	146.1(6)
Te3	0.27428(3)	0.54712(2)	0.32742(2)	155.6(6)
Te4	0.20828(3)	0.52383(2)	0.14798(2)	155.9(6)
Te5	-0.02771(3)	0.34316(2)	0.10664(2)	155.7(6)
Te6	0.07955(3)	0.24667(2)	0.24851(2)	145.1(6)
Te7	0.03788(3)	0.41154(2)	0.39261(2)	164.7(6)
Te8	-0.07073(3)	0.50746(2)	0.25047(2)	160.4(6)
Te9	-0.26539(3)	0.20622(2)	0.17358(2)	176.9(6)
Te10	-0.19369(3)	0.23018(2)	0.35450(2)	207.7(7)
Te11	-0.30688(3)	0.38207(2)	0.32504(2)	188.6(7)
Te12	-0.35434(3)	0.36452(2)	0.14525(2)	188.0(6)
Mo1	0.12620(3)	0.41140(2)	0.25141(2)	73.4(6)
Mo2	-0.11637(3)	0.34246(2)	0.24880(2)	71.9(6)
I1	0.42135(3)	0.20062(2)	0.28829(2)	171.5(6)
I2	0.36168(3)	0.43821(2)	0.53966(2)	227.0(7)
I3	0.16105(3)	0.44977(2)	-0.04292(2)	235.9(7)
I4	-0.33000(3)	0.29032(2)	-0.04388(2)	191.8(6)
I5	-0.07943(3)	0.05472(2)	0.29289(2)	172.1(6)
I6	-0.14299(4)	0.32255(2)	0.53245(2)	282.7(8)



$[\text{Mo}_2\text{Te}_{12}]^{6+}$  complex cation. The ellipsoids represent 95 % probability at 150(2) K.  
265x281mm (96 x 96 DPI)

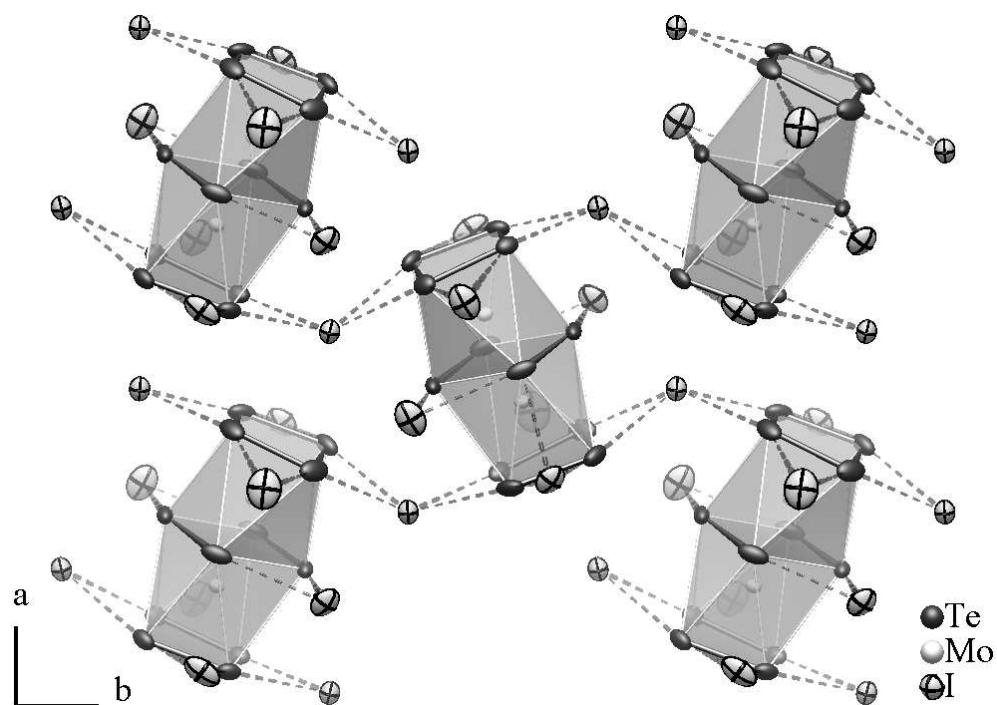
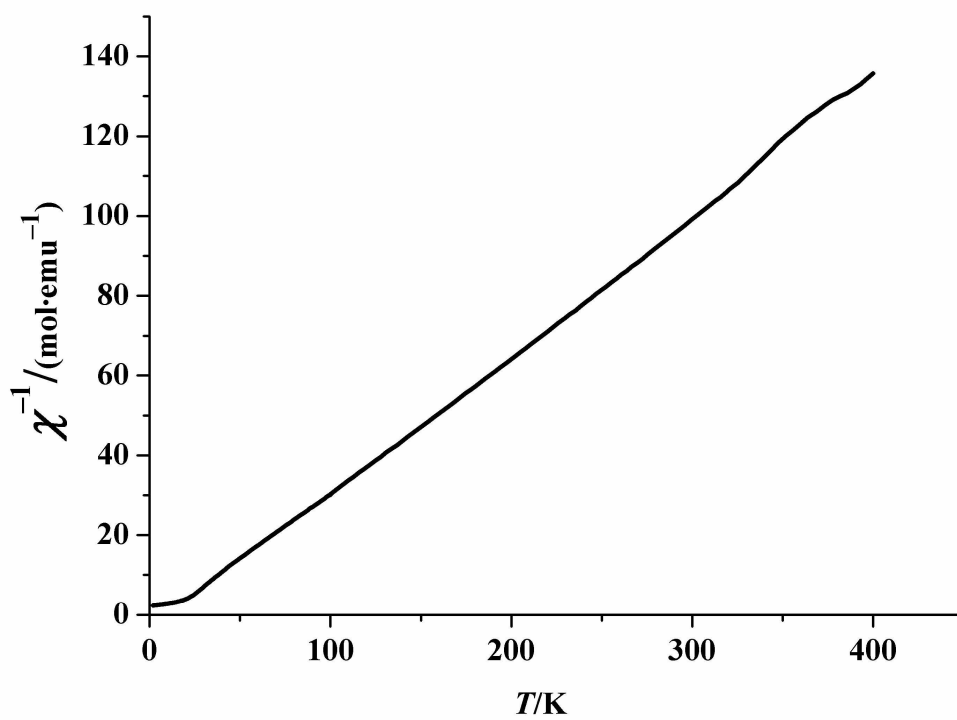


Figure 2. Section of the crystal structure of  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$ . The ellipsoids represent 95 % probability at 150(2) K.  
265x187mm (96 x 96 DPI)



Temperature dependence of reciprocal molar susceptibility for  $[\text{Mo}_2\text{Te}_{12}]\text{I}_6$  in a magnetic field of  $H = 35$  kOe.  
242x175mm (300 x 300 DPI)