

The Structures of Two Crystalline
Forms of Di- μ -bromobis{diethylenethioureatellurium(II)}
Dibromide

PER HERLAND, MAGNE LUNDELAND
and KJARTAN MARØY

Chemical Institute, University of Bergen,
N-5000 Bergen, Norway

Complexes of divalent tellurium with ethylenethiourea were prepared by Foss and Fossen.¹ Three different bromides of apparent composition $\text{Te}(\text{etu})_2\text{Br}_2$ were described.

Two of these crystallized in the monoclinic space group $C2/c$, one with four formula units per cell, and the other

one with eight formula units per cell. The third bromide crystallized in the orthorhombic space group $Fddd$, with sixteen formula units per cell.

The crystal structure of the monoclinic form of $\text{Te}(\text{etu})_2\text{Br}_2$ with four formula units per cell, was published together with the structure of the isomorphous diiodo complex, $\text{Te}(\text{etu})_2\text{I}_2$.² In these crystals the tellurium atoms are located in centres of symmetry, and the complexes are *trans* square-planar.

The crystal structure of the orthorhombic form, and of the monoclinic form with eight $\text{Te}(\text{etu})_2\text{Br}_2$ formula units per cell, have now been solved by Patterson and Fourier methods, and refined by a full-matrix least squares program, using three-dimensional diffractometer data. The intensity data, collected with $\text{MoK}\alpha$ radi-

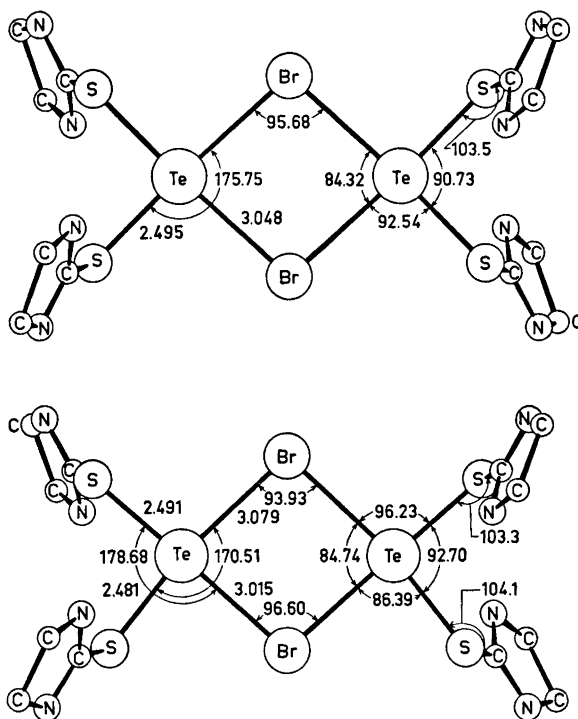


Fig. 1. The di- μ -bromo-bis{diethylenethioureatellurium(II)} cation. The upper figure is a view of the ion in the orthorhombic crystals as seen normal to the twofold axis passing through the bromine atoms, and normal to the twofold axis passing through the tellurium atoms. The lower figure shows the ion in the monoclinic crystals as seen normal to the twofold axis passing through the bromine atoms, and with the tellurium atoms in the plane of projection.

tion, were corrected for absorption and secondary extinction.

The orthorhombic crystals have unit cell dimensions (redetermined), $a=14.454(5)$ Å, $b=31.258(10)$ Å, $c=12.057(5)$ Å. The crystal used for intensity measurements was a flat prism of thickness 0.04 mm, and only 831 of the 2010 independent reflections attainable within $\theta=28^\circ$ were found to have net intensities higher than three times the standard deviation.

The monoclinic crystals have unit cell dimensions (redetermined), $a=26.734(8)$ Å, $b=11.437(4)$ Å, $c=9.321(4)$ Å, $\beta=101.97(6)^\circ$. Out of 3397 independent reflections attainable within $\theta=28^\circ$, 2349 were found to have net intensities higher than three times the standard deviation.

Using anisotropic thermal parameters for all atoms (hydrogen atoms were not included), the least squares refinement converged at conventional R values of 0.043 and 0.032, respectively, for the orthorhombic and the monoclinic crystals.

In both cases two bromine atoms and two ethylenethiourea sulphur atoms are coordinated to tellurium in a distorted square-planar *cis* arrangement. The bromine atoms are situated on twofold axes, and bridge two tellurium atoms. The result is a dinuclear cation of composition $[(\text{etu})_2\text{TeBr}_2\text{Te}(\text{etu})_2]^{2+}$. In the orthorhombic crystals the tellurium atoms and bromide ions are also situated on twofold axes.

The figure gives views of the cations in the two crystalline forms, with principal bond lengths and angles. The maximum e.s.d. of a bond length given is 0.003 Å.

As seen from the two *cis* S—Te—Br bond angles, the two *trans* S—Te—Br bond angles, and the two Br—Te—Br bond angles, and from the two Te—Br bond lengths, the cation in the monoclinic crystals differs slightly from the higher symmetry of the cation in the orthorhombic crystals.

The TeBr_2S_2 groups are nearly planar, the $\text{TeBr}_2/\text{TeS}_2$ dihedral angles being 4.0° in the orthorhombic form and 3.4° in the monoclinic form.

The average values of the Te—Br and Te—S bond lengths are 3.047 Å and 2.489 Å, compared to 2.994 Å and 2.449 Å for the corresponding bonds in the mononuclear complex *cis*-dibromobis(trimethylenethiourea)tellurium(II), $\text{Te}(\text{trtu})_2\text{Br}_2$.³ In the latter complex the Br—Te—Br bond angles are about 12° larger than in the present

complex cations. The Te—Te distances are nearly the same in the two dinuclear cations, with an average value of 4.510 Å.

Acknowledgement. We wish to thank Prof. Olav Foss for the crystals, and for his interest.

1. Foss, O. and Fossen, S. *Acta Chem. Scand.* **15** (1961) 1618.
2. Foss, O., Kjøge, H. M. and Marøy, K. *Acta Chem. Scand.* **19** (1965) 2349.
3. Fredin, K. S., Marøy, K. and Slogvik, S. *To be published.*

Received July 11, 1972.

Exchange of Brain Organelle Proteins with Soluble Cytoplasmic Proteins *in vitro*

K. HEMMINKI

Department of Medical Chemistry, University of Helsinki, SF-00170 Helsinki 17, Finland

The present evidence suggests that all cellular protein constituents undergo continual synthesis and degradation.¹ The assembly of constituent proteins in intracellular structures and their degradation remain poorly understood.² The assembly of bacterial ribosomal proteins appears to be an ordered and co-operative process,³ but contradictory data have been reported concerning their degradation as to whether they are degraded as a unit⁴ or individually.¹ The latter alternative was proposed by an experiment *in vitro* showing a ready exchange of radioactive ribosomal proteins with a nonradioactive supernatant and *vice versa*.¹ Less is known about the exchange of protein in other organelles, although transfer of protein has been described between microsomes and mitochondria *in vitro*.⁵ By contrast, the exchange of phospholipids between various structures is well established.^{6,7}

This paper reports a consistent exchange of proteins between a supernatant fraction and different organelle fractions incubated