

## 5. Summary

The tellurium tetracyanide solvates, tellurium dicyanide difluoride solvate and tellurium dicyanide oxide solvate described herein have been synthesised from tellurium tetrafluoride and trimethylsilyl cyanide. These solvates belong to the first structurally characterised cyano-compounds of tellurium (IV).

It has been shown that tellurium tetracyanide solvates crystallize both as polymers and monomers. The polymeric tellurium tetracyanide solvates can be described as  $[\text{Te}(\text{CN})_3\text{CN}]_n$  (solvent molecules omitted), whose structures contain trigonal-pyramidal  $\{\text{Te}(\text{CN})_3\}$ -units. These tellurium tricyanide units are conjoined through a bridging cyano ligand to form the chain. The monomeric tellurium tetracyanide solvates contain  $\Psi$ -trigonal-bipyramidal  $\text{Te}(\text{CN})_4$ -units (including the lone pair of tellurium). We assume that the difference between polymeric and monomeric solvates of tellurium tetracyanide is caused by the different donor atoms coordinated to tellurium.

Furthermore, due to the  $^{13}\text{C}$ -,  $^{125}\text{Te}$ -NMR-spectra, could be shown that the ligands of  $\text{Te}(\text{CN})_4$  exhibit intramolecular and intermolecular exchange.

In order to improve the understanding of the structures of tellurium tetracyanide solvates, several solvates of tellurium tetrahalogenides have been synthesized and their structures have been compared with the corresponding structures of tellurium tetracyanide solvates. There is a great variety in the crystal structures of these solvates depending on the solvent molecules.

In  $\text{Te}(\text{CN})_2\text{F}_2 \cdot (\text{dme})_2$  the tellurium is, like in the monomeric tellurium tetracyanide solvates, in a pseudo-trigonal-bipyramidal- arrangement. Two fluorine atoms lie in the axial positions and the cyanide groups and the lone electron pair are in equatorial positions.

The dynamic  $^{13}\text{C}$ -NMR-spectra of  $\text{Te}(\text{CN})_3\text{F}$  and of  $\text{Te}(\text{CN})_3\text{Cl}$  have been investigated. An intramolecular exchange occurs in these compounds. From the NMR-spectroscopic data we could derive the energy barriers of this exchange process. The  $\text{Te}(\text{CN})_3\text{Cl}$ -molecules have a smaller energy barrier for the intramolecular exchange of the ligands than the  $\text{Te}(\text{CN})_3\text{F}$ -molecules.

It could be shown that in dimeric  $[\text{Te}(\text{CN})_2\text{O}\cdot(\text{dme})_2]_2$  the tellurium atoms are conjoined through asymmetrical oxygen bridges.

Furthermore the synthesis and structural characterisation of  $\text{Te}(\text{CN})_2\cdot(\text{CH}_3)_3\text{SiCl}$  has been successful. The tellurium dicyanide molecules form a layered-crystal-structure. Trimethylsilyl chloride molecules occupy pockets inside the layer.