

NOTE

Diorganotellurium(IV) Dihalide Complexes with Bidentate Schiff Base Ligands—Part-I

SHEKHAR SRIVASTAVA* and DEEPA SINGH†

Department of Chemistry

University of Allahabad, Allahabad-211 002, India

Sixty molecular adducts of organotellurium(IV) with bidentate Schiff base ligands of the type $RR^1 TeX$.SB have been prepared and analysed to determine their structure by various physico-chemical techniques, *i.e.*, elemental analysis, molar conductivity, IR and X-ray photoelectron spectroscopy.

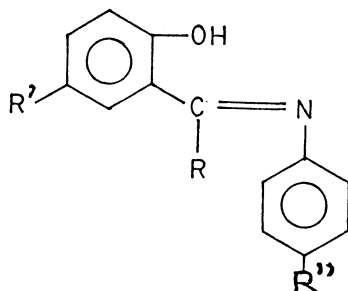
Although many organotellurium(IV) complexes have been synthesised and their structures have also been characterised by various physico-chemical techniques¹, organotellurium(IV) complexes with Schiff base ligands are less known^{2–10}. This paper deals with synthesis of many organotellurium(IV) complexes with various bidentate Schiff base ligands and their structural determination by various physico-chemical techniques.

$(p\text{-MeOC}_6\text{H}_4)_2\text{TeCl}_2^{11}$; $(\text{C}_6\text{H}_4)_2\text{TeCl}_2^{13}$; $(\text{C}_6\text{H}_5\text{CH}_2)_2\text{TeI}_2^{12}$; $(p\text{-Me}_2\text{NC}_6\text{H}_4)$

$(p\text{-MeOC}_6\text{H}_4)\text{TeCl}_2^{11}$ and $(p\text{-Me}_2\text{NC}_6\text{H}_4)(p\text{-EtOC}_6\text{H}_4)\text{TeCl}_2^{11}$ have been prepared, purified and characterised by reported methods.

1 mmol of 2-hydroxy-5-methyl acetophenone or 2-hydroxy-5-methyl-propiophenone or 2-hydroxy-5-methyl butyrophenone or salicylaldehyde in 50 mL of methanol was mixed with 1 mmol aniline or *p*-toluidine or *p*-anisidine. The mixture was refluxed for 3 h. TLC suggested complete conversion of above ketone or aldehyde to Schiff base. The solid product was obtained after rotary evaporation. It was further air-dried and characterised by C, H and N analyses.

The following twelve such Schiff base ligands have been prepared:



†Department of Chemistry, Priyadarshini College of Computer Science, Sector-5, Noida-201 301, India.

SB₁ = R = CH₃, R' = CH₃ and R'' = H; SB₂ = R = C₂H₅, R' = CH₃ and R'' = H; SB₃ = R = C₃H₇, R' = CH₃ and R'' = H; SB₄ = R = H, R' = H and R'' = H; SB₅ = R = CH₃, R' = CH₃ and R'' = CH₃; SB₆ = R = C₂H₅, R' = CH₃ and R'' = CH₃; SB₇ = R = C₃H₇, R' = CH₃ and R'' = CH₃; SB₈ = R = H, R' = H and R'' = CH₃; SB₉ = R = CH₃, R' = CH₃ and R'' = OCH₃; SB₁₀ = R = C₂H₅, R' = CH₃ and R'' = OCH₃; SB₁₁ = R = C₃H₇, R' = CH₃ and R'' = OCH₃; SB₁₂ = R = H, R' = H and R'' = OCH₃.

1 mmol of (*p*-MeOC₆H₄)₂TeCl₂ or (C₆H₄)₂TeCl₂ or (C₆H₅CH₂)₂TeI₂ or (*p*-Me₂NC₆H₄)(*p*-MeOC₆H₄)TeCl₂ or (*p*-Me₂NC₆H₄)(*p*-Et + OC₆H₄)TeCl₂ in dry CHCl₃ was mixed with 1 mmol of any above prepared bidentate Schiff base ligand. The mixture was refluxed about 3 h. The solid product was obtained after rotary evaporation. It was further purified by *pet.* ether (60–80°C) and air-dried.

Conductance measurements in acetone were made at room temperature using a Digisun electronic conductivity bridge. Infrared spectra were recorded on a Perkin-Elmer 457 spectrophotometer in CsI. The X-ray photoelectron spectra were recorded on a V.G. Scientific ESCA-3 MK(II) electron spectrometer. The AlK_α (1486.6 eV) was used for photoexcitation. The Cu2p_{3/2} (BE = 932.8 ± 0.2 eV) and Au4f_{7/2} (BE = 83.8 ± 0.1 eV) lines were used to calibrate the instrument and Ag3d_{5/2} (Be = 368.2 eV) was used for cross-checking¹⁴.

The elemental analyses of these molecular adducts are within ±0.5% for C, H and N. The molar conductances were observed in the range 20–30 ohm⁻¹ cm² mol⁻¹ in acetone suggesting absence of ionic species. Both elemental analysis and molar conductance have suggested the composition of RR'TeX.SB¹⁵.

All these molecular adducts exhibit the ν(C=N) absorption band at 1650 cm⁻¹ to 1620 cm⁻¹ in the free ligands²⁻¹⁰. The lowering of this band in the complexes indicates the coordination of nitrogen atoms of azomethine groups to the tellurium. The far IR spectra exhibited bands at 560–540 cm⁻¹, 420–410 cm⁻¹, 290–280 cm⁻¹ and 320–310 cm⁻¹ for ν(Te—C)¹², ν(Te—N)¹², ν(Te—Cl)¹² and ν(Te—O)¹³ respectively.

It was observed that the binding energies of Te 3d 3/2, 5/2 in the starting material RR'TeX₂ was higher than prepared molecular adducts RR'TeX.SB. This concluded that the electron density on Te metal ion has been increased by coordination of Schiff base ligands with tellurium metal ion¹⁴. It was observed that O1s binding energy in RR'TeX.SB molecular adducts was higher than O1s binding energies of their Schiff base ligands. These observations concluded that oxygen atom of Schiff base ligand is also bonded with tellurium metal ion¹⁴. The N1s photoelectron peaks in all these molecular adducts RR'TeX.SB have shown much higher binding energy than N1s binding energy of their Schiff base ligands. These observations suggests that nitrogen atoms of Schiff base ligands are coordinated to central metal ion¹⁴. The Te3s photoelectron peak of all these prepared molecular adducts of the type RR'TeX.SB has shown single symmetrical peak without any splitting in the photoelectron peak. These observations in Te3s photoelectron peak confirm the diamagnetic nature of these prepared molecular adducts¹⁴.

On the basis of elemental analysis, conductivity results, showing the complexes to be non-ionic and IR and X-ray photoelectron spectra (XPS) identifying

the site of coordination, it is possible to assign a structure for each adduct as shown in Fig. 1.

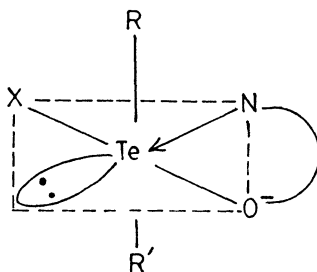


Fig. 1 Structure of $RR'TeX \cdot SB$

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