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NOTE

Some Dibenzyltellurium(IV) Complexes with Schiff Base Ligands: A Photoelectron Spectroscopic Study

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Three complexes of Te(IV) of the type [R_2TeSB] (where $R = C_6H_5CH_2$, SB = Schiff base ligands, *i.e.*, acac$_2$en = *bis*-(acetylacetone)-ethylenediamine, benac$_2$en = *bis*-(benzoylacetone)-ethylenediamine and dibenmethan$_2$en = *bis*-(dibenzoylmethane)-ethylenediamine) have been prepared and their structures have been assigned on the basis of elemental analysis, molar conductance, IR and X-ray photoelectron spectral data.

Although $(C_6H_5CH_2)_2TeI_2$ is well known in the literature[1], its reaction with Schiff base ligands has not been studied so far. The present communication deals with reaction of $(C_6H_5CH_2)_2TeI_2$ with acac$_2$en, *i.e.*, *bis*-(acetylacetone)-ethylenediamine, benac$_2$en, *i.e.*, *bis*-(benzoylacetone)-ethylenediamine and dibenmethan$_2$en, *i.e.*, *bis*-(dibenzoylmethane)-ethylenediamine Schiff base ligands. The $(C_6H_5CH_2)_2TeI_2$[1] and the Schiff bases acac$_2$en, benac$_2$en and dibenmeth$_2$en[2] were prepared, purfied and characterised according to literature procedure.

To a dry chloroform solution containing $(C_6H_5CH_2)_2TeI_2$ (1 mmol) was added Schiff base (1 mmol), the resulting solution was stirred at 60°C temperature under dry nitrogen. After 6 h the stirring was stopped and pale yellow complex was filtered, washed repeatedly with ether and dried over P_4O_{10} in vacuum.

Conductance measurements were obtained in DMF at room temperature using a Digisun electronic conductivity bridge. Infra-red spectra were recorded in CsI on a Perkin-Elmer 457 spectrometer. The X-ray photoelectron spectra were recorded on a VG Scientific ESCA-3 MK-II electron spectrometer. The MgK$_\alpha$ X-ray line (1253.6 eV) was used for photoexcitation. The Cu2p$_{3/2}$ (BE = 932.8 ± 0.2) and Au4f$_{7/2}$ (BE = 83.8 ± 0.1) lines were used to calibrate the instrument and Ag3d$_{5/2}$ (BE = 368.2) was used for cross-checking[3]. All the spectra were recorded using the same spectrometer parameters of 50 eV pass energy and 4 mm slit width. The reduced full width at half maximum (FWHM) at the Au4f$_{7/2}$ (BE = 83.8 eV) level under these conditions was 1.2 eV.

All the complexes were air-stable. Elemental analyses were within ±0.5% for C, H and N. The observed molar conductances of all the complexes in DMF were lower than 60 ohm^{-1} cm^2 mol^{-1}, indicating that all these prepared complexes are non-electrolyte[4]. All the complexes exhibit the ν(C=N) absorption around 1620–1610 cm^{-1}, which normally appears at 1650–1640 cm^{-1} in the free ligands[5, 6]. The lowering of this band in the complexes indicates the coordination of nitrogen atoms of azomethine groups to the tellurium[5–6]. The far IR spectra exhibited bands at 560–540 cm^{-1}, 420–410 cm^{-1} and 320–310 cm^{-1} for ν(Te—C),[7], ν(Te—N)[1], ν(Te—O)[9] respectively.

The binding energy data of $Te3d_{3/2}$ and $Te3d_{5/2}$ photoelectron peaks for $(C_6H_5CH_2)_2TeI_2$ were observed at 584.0 eV and 573.8 eV respectively, higher than observed in these prepared metal complexes, $Te3d_{3/2} = 582.6$ eV and $Te3d_{5/2} = 572.6$ eV. It was also noticed that Ols and Nls binding energy data are maximum for $acac_2en$ and minimum for $dibenmethan_2en$. The decreasing order of effective positive charge on Ols and Nls in these Schiff base ligands is: $acac_2en > benac_2en > dibenzoylmethan_2en$[8]. It is clear that phenyl group of $benac_2en$ and $dibenzoylmethan_2en$ increases the electron density on nitrogen and oxygen atoms; this electron density is more in $dibenzoylmethan_2en$ oxygen and nitrogen atoms due to the presence of two phenyl groups on an aromatic ring. The trend of oxygen and nitrogen binding energies in the metal complexes was same as in ligands. Further, the values of Ols and Nls binding energies in the metal complexes were more positive than their free ligands. These XPS data suggest that Schiff base ligands are coordinated to tellurium metal ion[8].

Thus on the basis of the above studies, the following tentative structure may be proposed for these complexes (Fig. 1).

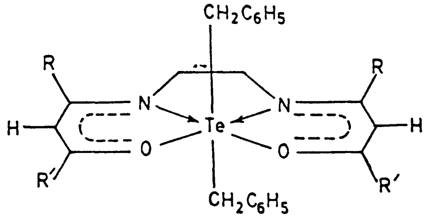

Fig.1: Structure of [R_2Te SB]

Fig. 1 Structure of [R_2TeSB]

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