

SHORT COMMUNICATION

$\text{Me}_4\text{NO}_2\text{CSO}_3\text{H}_2\text{SnPh}_3\text{Cl}$ AND $\text{enH}_2\text{O}_2\text{CSO}_3\text{SnPh}_3\text{Cl}$ SYNTHESIS AND INFRARED STUDY

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Abstract: $\text{Me}_4\text{NO}_2\text{C-SO}_3\text{H}_2\text{SnPh}_3\text{Cl}$ and $\text{enH}_2\text{O}_2\text{C-SO}_3\text{SnPh}_3\text{Cl}$ are obtained on allowing $\text{Me}_4\text{NO}_2\text{C-SO}_3\text{H}$ and $\text{enH}_2\text{O}_2\text{C-SO}_3$ to react with SnPh_3Cl in respectively mixed solution (ethanol/water) or ethanolic solution in specific ratios. Their infrared studies have been carried out and structures as dimers, suggested when hydrogen bonds are involved.

Keywords: SnPh_3 residue, planar geometry, monodentate, bidentate, $\text{O}_2\text{C-SO}_3^{2-}$ anion, trigonal bipyramidal environment

INTRODUCTION

The chemistry of the organotin (IV) derivatives is being subject of growing interest due to the numerous applications in many fields [1-7]. In this dynamic, our group has reported several papers including diorganotin (IV) and triorganotin (IV) [8-15]. In this work, we have initiated the studies on the interactions between $\text{Me}_4\text{NO}_2\text{CSO}_3\text{H}$, $\text{enH}_2\text{O}_2\text{C-SO}_3$ and SnPh_3Cl in specific ratios which have yielded $\text{Me}_4\text{NO}_2\text{C-SO}_3\text{H} \cdot 2\text{SnPh}_3\text{Cl}$ and $\text{enH}_2\text{O}_2\text{C-SO}_3 \cdot \text{SnPh}_3\text{Cl}$ as new adducts which infrared studies have been carried out then structures suggested on the basis of spectroscopic data.

MATERIALS AND METHODS

$\text{Me}_4\text{NO}_2\text{C-SO}_3\text{H}$ and $\text{enH}_2\text{O}_2\text{C-SO}_3$ are obtained on mixing aminoimino-methanesulphonic acid respectively with Me_4NOH and ethylenediamine (en) in water in 1/1 ratios; white and yellow crystals are collected after a solvent evaporation at 60 °C. When a mixed solution (ethanol/water) of $\text{Me}_4\text{NO}_2\text{C-SO}_3\text{H}$ and aqueous solution of $\text{enH}_2\text{O}_2\text{C-SO}_3$ are mixed with an ethanolic solution and an aqueous solution of SnPh_3Cl in respectively 2/1 and 1/1 ratios, clear solutions are obtained and stirred during two hours. When submitted to a slow solvent evaporation, these solutions yield white powders. The elemental analyses data for compounds **A** and **B** (Table 1) have allowed to suggest $\text{Me}_4\text{NO}_2\text{C-SO}_3\text{H} \cdot 2\text{SnPh}_3\text{Cl}$ and $\text{enH}_2\text{O}_2\text{C-SO}_3 \cdot \text{SnPh}_3\text{Cl}$ formula.

Table 1. Results of the elemental analyses

Compound	Chemical formula	Elemental analysis (%)					
		C		H		N	
		calc.	found	calc.	found	calc.	found
A	$\text{Me}_4\text{NO}_2\text{C-SO}_3\text{H} \cdot 2\text{SnPh}_3\text{Cl}$	50.76	51.16	4.47	4.21	1.44	1.79
B	$\text{enH}_2\text{O}_2\text{C-SO}_3 \cdot \text{SnPh}_3\text{Cl}$	44.04	43.92	4.58	4.69	4.89	5.32

The infrared spectra was recorded by a Perkin Elmer (4400-350 cm^{-1}) spectrometer (Dakar University), the sample being as Nujol mulls while CsI windows were used. The elemental analyses have been performed at the laboratory of Microanalyses at the University of Bath (UK). Infrared data are given in cm^{-1} – IR abbreviations: br (broad) (vs) very strong, (s) strong, (m) medium, (sh) shoulder, (vw) very weak. All the chemicals were purchased from Aldrich and used without any further purification.

RESULTS AND DISCUSSION

Let us consider the infrared data of the compound **A** and **B**:

(**A**): $\nu \text{SO}_3 = 1074$ (s); $\nu_{\text{as}} \text{CO}_2 + \delta_{\text{s}} \text{NH}_2 = 1620$ (sh) + 1560 (sh); $\nu \text{Ph} = 728$ (m); 695 (m); $\nu_{\text{s}} \text{CO}_2 = 1377$ (s); $\nu \text{OH} + \delta \text{OH} = 3400$ (br) + 1550 (sh);

(B): ν SO₃ = 1123 (s); ν_{as} CO₂ + δ_s NH₂ = 1662 (m); 1589 (m); ν Ph = 729 (vs); 695 (vs); ν_s CO₂ = 1331 (w); ν OH + δ OH = 3390 (br) + 1562 (m).

The broad band spreading from 2900 cm⁻¹ to 3500 cm⁻¹ is an evidence of hydrogen bonds in the compound **A**. Therefore, the suggested structure is a tetranuclear dimer in which the tin atoms are *trans* coordinated by the bidentate O₂C-SO₃H⁻ anion and a chlorine atom in a trigonal bipyramidal environment, the SnPh₃ residues having planar geometries. The two [O₂C-SO₃H₂SnPh₃Cl]⁻ anionic components are linked by hydrogen bonds of acetic acid type (Figure 1).

The broad band centred to 3100 cm⁻¹ show the existence of hydrogen bonds in the structure of compound **B**. On the basis of these infrared data, the structure suggested is a dinuclear dimer in which the tin atoms are *trans* coordinated in a trigonal bipyramidal environment. In each monomer, the O₂C-SO₃²⁻ anion is monodentate and transcoordinated to SnPh₃Cl group, thus the SnPh₃ skeleton has a planar geometry. The two [O₂C-SO₃SnPh₃Cl]²⁻ anionic components are linked by hydrogen bonds through enH²⁺ cations and oxygen atoms from O₂C-SO₃²⁻ anions (Figure 2).

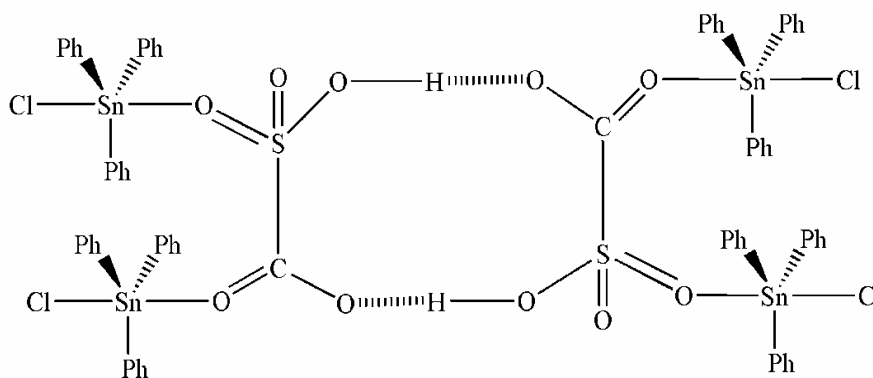


Figure 1. Proposed structure for the [O₂C-SO₃SnPh₃Cl]²⁻ dimer

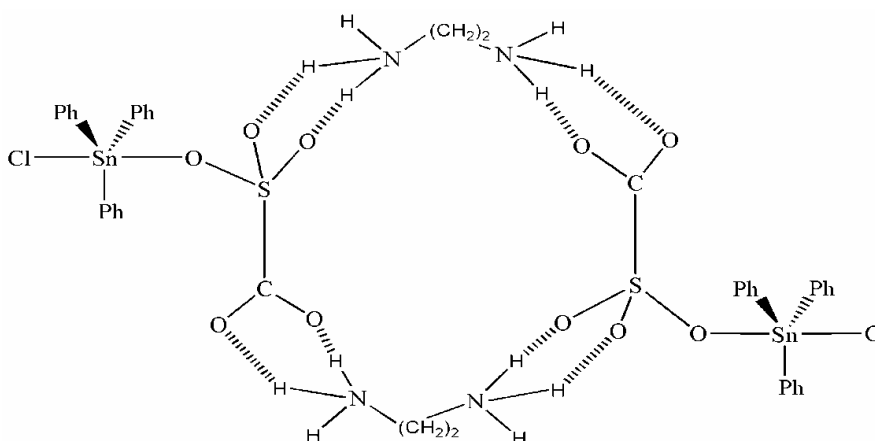


Figure 2. Proposed structure for the compound **B**

In this second adduct when the free NH groups are involved in hydrogen bonding supramolecular architectures are obtained.

CONCLUSIONS

The studied complexes are dimer structures if hydrogen bonds are involved, the tin centre having trigonal bipyramidal environments, the $\text{O}_2\text{C-SO}_3\text{H}^-$ and $\text{O}_2\text{C-SO}_3^{2-}$ anions behaving as bidentate and monodentate ligands. Supramolecular architectures are suggested in the second adduct when hydrogen bonds are involved.

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