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ORIGINAL RESEARCH PAPER

NEW HYDROGENOMOLYBDATO $SnPh_2$ AND $SnPh_3$ RESIDUE CONTAINING ADDUCT AND DERIVATIVE: SYNTHESIS AND INFRARED STUDY

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Abstract: Three new organostannic complex, adduct and derivative have been synthesized and studied by infrared. Dimeric structures involving the cations were suggested on the basis of infrared data. The molybdate anion behaves as a non coordinating ligand-only involved in hydrogen bonds-, mono- or bicoordinating and always involved in hydrogen bonds. The environment of the tin centres is trigonal bipyramidal or octahedral.

Keywords: *dimeric structures hydrogen bonds, non coordinating, mono- and bicoordinating ligand, trigonal bipyramidal or octahedral environments*

INTRODUCTION

Because of their variety of applications and because of their structural interest too, many research groups including ours have been focusing since years and years in targeting new organotin compounds for further biological tests [1-9]. We report here the study of the interactions between $(Cy_2NH_2)HMoO_4 .H_2O$ and $SnPh_3Cl$ or $SnPh_2Cl_2$ witch have given these three derivative, complex and adduct, infrared and Mossbauer studies of which have been carried out then structures suggested on the basis of spectroscopic data.

EXPERIMENTAL

($Cy_2NH_2)HMoO_4 \cdot H_2O$ has been obtained as a powder as described in [10,11]. The studied compounds have been obtained as white precipitates on mixing $(Cy_2NH_2)HMoO_4 \cdot H_2O$ with $SnPh_3Cl$ or $SnPh_2Cl_2$ in specific ratios. The analytical data % calculated (% found) with the ratio $(Cy_2NH_2)HMoO_4$/organotin (IV) chloride reported below have allowed to suggest the following formulae.

Table 1. *Analytical data*

Compounds	Ligand	Ratio (salt/MX_n)	% cal (% found)
A_1	L	2/1	C : 39.89 (39.61); H : 5.40 (5.88); N : 1.94 (1.58)
A_2	L	4/1	C : 42.18 (42.12); H : 4.84 (4.79); N : 1.64 (1.62)
A_3	L	1/3	C : 44.34 (42.11); H : 4.34 (4.45); N : 0.86 (0.72)

A_1 : $(Cy_2NH_2)HMoO_4\,SnPh_2Cl_2 \cdot 2H_2O$ **L : $(Cy_2NH_2)HMoO_4 \cdot 2H_2O$**
A_2 : $Cy_2NH_2(HMoO_4)_2\,SnPh_3$
A_3 : $Cy_2NH_2\,(HMoO_4)_2\,SnPh_3 \cdot 2SnPh_3Cl$

The elemental analyses have been performed by the Microanalytical Laboratory of the University of BATH-UK, the infrared spectra at Dakar University as KBr pellets using a Perkin Elmer of BXFTIR. All the chemicals were purchased from ALDRICH Company (Germany) without any further purification.

RESULTS AND DISUSSION

Let us consider their data [abbreviations: (vs) very strong, (s) strong, (L) large, (m) medium, (w) weak] of the studied compounds:
(A_1): ν MoO_4 : 911 (s); 877 (s); 790 (vs); δ MoO_4 : 669 (m); 662 (w); 556 (w); 481 (w); (ν OH; ν NH-O): 3449 (L); 3067 (m); 3053 (m); 3007 (m).
(**A_2**): ν MoO_4 : 897 (w); 843 (m); 792 (vs); δ MoO_4 : 660 (m); 455 (w); 400 F; ν N-H : 2800 F; 2900 F; ν OH-O : 3500 (L); 3100 (m); 3000 (m); δ OH : 1600 (w).
(**A_3**): ν MoO_4 : 813 (s); 696 (m); δ MoO_4 : 661 (w); 453 (m); δ OH : 1637 (L); ν OH : 3398 (L); 3142 (m); ν Sn-Cl : 338 (w).

It is not possible from infrared data to deduce the point group and the coordination type of $HMoO_4^-$ because of the substitution:

- $(Cy_2NH_2)HMoO_4 \cdot SnPh_2Cl_2 \cdot 2H_2O$: the existence of $SnPh_2Cl_2 \cdot 2H_2O$ has yet been repoted by Amini and al [12]. On assuming the presence of such adduct in the structure of the studied adduct we can reasonably suggest the structure reported on (Figure 1) with a non coordinating molybdate – only involved in hydrogen bonds-and coordinating water molecules. Is seems worthy to outline the fact that $HMoO_4^-$ are linked as acetic acid hydrogen bonded pairs.

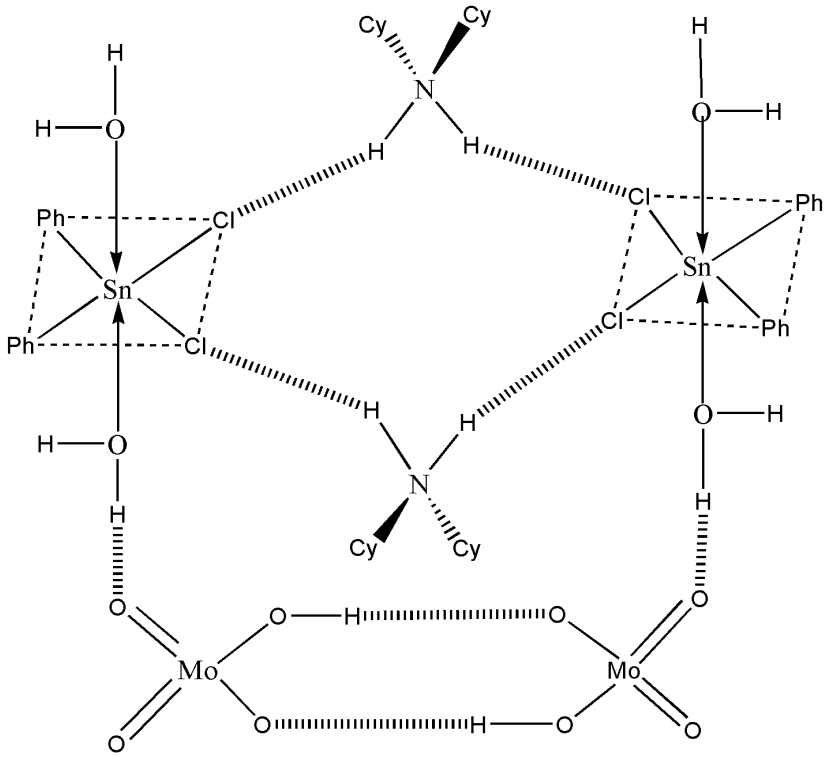

Figure 1. *Proposed structure for A_1*

- $Cy_2NH_2(HMoO_4)_2SnPh_3$: the complex anion $[(PhPO_3H)_2SnMe_3]^-$ had yet been reported by Diop and al [13]: it consists of a $SnPh_3$ residue trans coordinated by two monodentate ligands leading to a trigonal bipyramidal environment around the the tin centre. By similarity we propose for this derivative the same structure with monocoordinating ligand. When cations arte involved the dimeric structure reported on figure 2 is obtained. Because of the presence of free OH groups, while considering intermolecular OH---O bonds a supramolecular architecture is obtained.

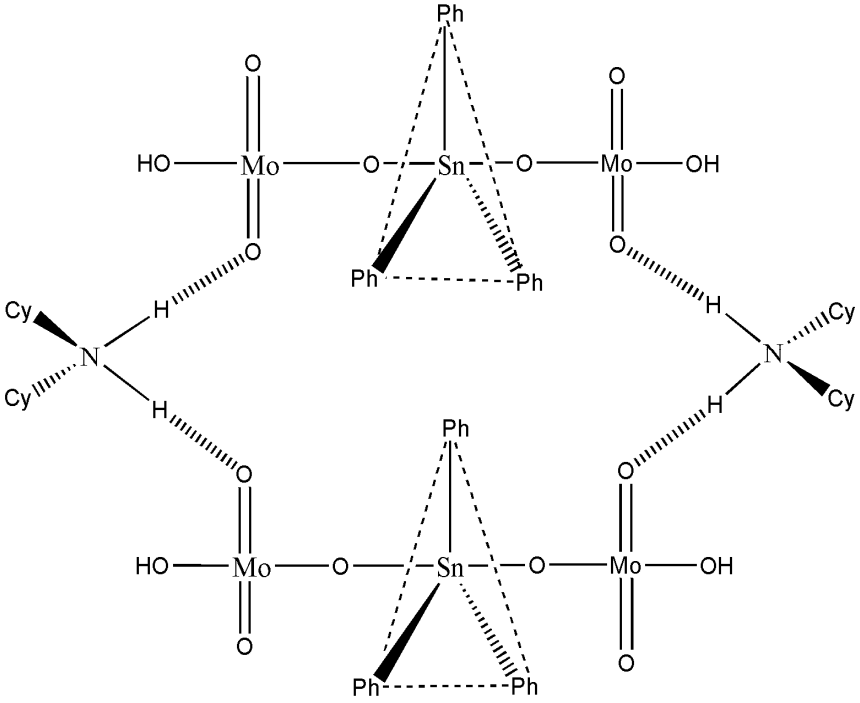

Figure 2. *Proposed structure for* A_2

- $Cy_2NH_2(HMoO_4)_2SnPh_3 \cdot 2SnPh_3Cl$: this complex can be considered as a 1/2 adduct between $Cy_2NH_2(HMoO_4)_2\ SnPh_3$ and $SnPh_3Cl$. So its structure derives from the one of $Cy_2NH_2(HMoO_4)_2\ SnPh_3$ by adding four $SnPh_3Cl$ molecules; the suggested structure is reported (Figure 3).

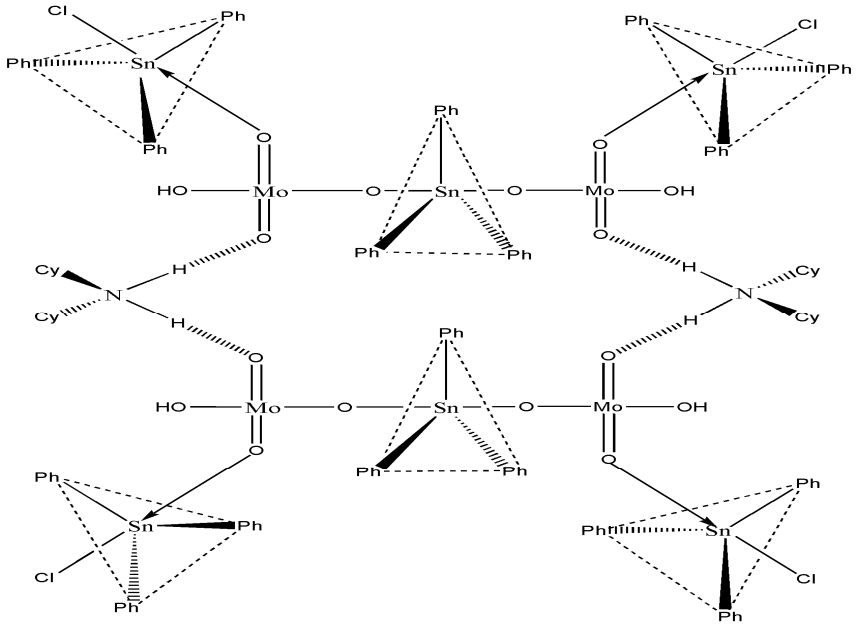

Figure 3. *Proposed structure for* A_3

CONCLUSION

The studied tin (IV) compounds have dimeric structures, the anion behaving as a non coordinating- only hydrogen bonds involved- monocoordinating- or bridging ligand. The environments around the tin centres are octahedral or trigonal bipyramidal. When the cations are involved, dimeric structures are obtained. In the case of the derivative $Cy_2NH_2(HMoO_4)_2SnPh_3$ because of the presence of free OH groups, while considering intermolecular OH---O bonds a supramolecular architecture is obtained.

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