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SHORT COMMUNICTION

$Cy_2NH_2NO_3SnBu_2Cl_2 \cdot H_2O$ AND $Cy_2NH_2NO_3SnPh_2Cl_2 \cdot 2H_2O$: SYNTHESIS AND INFRARED STUDY

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Abstract: On allowing $Cy_2NH_2NO_3$ to react with $SnBu_2Cl_2$ and $SnPh_2Cl_2$, the two studied adducts were obtained. While considering the complex-anions $[SnBu_2Cl_2NO_3.H_2O]^-$ and $[NO_3.SnPh_2Cl_2\ H_2O]^-$, discrete structures were suggested with monocoordinating nitrate and octahedral environment around the tin centre. When the cation is involved through N-H----O or N-H----Cl hydrogen bonds, suppramolecular architectures are obtained.

Keywords: *discrete structures, monocoordinating O_3^-, SnR_2 residue, suppramolecular architectures*

INTRODUCTION

Many molecules belonging to organotin(IV) family are known for their applications in industry, medicine [1].This explains the focus of many research groups in this field, trying to widen it [2 - 7]. Our group since many years is involved in this dynamic and has published several papers [8 - 13]. In this paper we have initiated the study of the interactions between $Cy_2NH_2NO_3$ and SnR_2Cl_2 (R = Ph, Bu) which have yielded two adducts; their infrared study has been carried out, then structures suggested on the basis of these data.

MATERIALS AND METHODS

$Cy_2NH_2NO_3$ has been obtained on neutralizing nitric acid (HNO_3) by dicyclohexylamine Cy_2NH in water solution; a white precipitate is obtained stirred no less than two hours and filtered.
When $Cy_2NH_2NO_3$ and $SnPh_2Cl_2$ or $SnBu_2Cl_2$ are mixed as ethanolic solutions in 1/1 ratio white crystals **A** or a white powder **B** are obtained after a slow solvent evaporation. The analytical data of compounds **A** and **B** are presented in Table 1.

Table 1. *Results of the elemental analyses of compounds* **A** *and* **B**

Compound	Chemical formula	Elemental analysis (%)					
		C		H		N	
		calc.	found	calc.	found	calc.	found
A	$Cy_2NH_2NO_3.SnPh_2Cl_2{\cdot}2H_2O$	46.18	46.18	6.09	5.79	4.49	4.65
B	$Cy_2NH_2NO_3.SnBu_2Cl_2{\cdot}H_2O$	43.80	43.60	7.83	7.63	5.01	5.09

The elemental analyses were performed by the Microanalyses Centre – University of Bath - UK. The infrared spectra have been recorded at the University of Cheikh Anta Diop (Dakar, Senegal) by means of a Bruker FT-IR spectrometer, the samples being as Nujol mulls, using CsI windows. Infrared data are given in cm^{-1} - IR abbreviations: (br) broad, (vs) very strong (s) strong, (sh) shoulder. The chemicals were purchased from Aldrich and used as such.

RESULTS AND DISCUSSION

Let us consider the IR data of the studied adducts
A: $\upsilon(NH_2)$: 3400 (br), $\delta(NH_2)$: 1578 (vs), $\upsilon_1$1032s, $\upsilon_3$1306 (s), 1294 (s);
B: $\upsilon(NH_2)$: 3200 (br), $\delta(NH_2)$: 1650 (vs), $\upsilon_1$1034 (s), $\upsilon_3$1325 (s), 1275 (sh).
The X-ray structure of the compound $Et_4NNO_3.SnPh_2Cl_2$ has been determined by Diop and al. [14]. Its structure consists of a nitrate monocoordinating $SnPh_2Cl_2$ leading to a trigonal bipyramidal environment around the tin centre.
We can suggest a similar structure for $Cy_2NH_2NO_3.SnPh_2Cl_2{\cdot}2H_2O$ adduct while considering the complex-anion $[NO_3.SnPh_2Cl_2]^-$ (Figure 1) - the water molecules are

considered as lattice. When the cation is involved through N-H---O or N-H----Cl hydrogen bonds suppramolecular architecture is obtained.

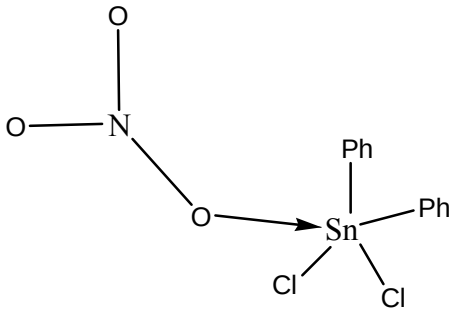

Figure 1. *Proposed structure for the compound* ***A***

The absence of $vsSnBu_2$ on the IR spectrum of $Cy_2NH_2NO_3.SnBu_2Cl_2{\cdot}H_2O$ expected around $617cm^{-1}$ is an indication of the presence of a linear $SnBu_2$ residue [15] allowing to suggest while considering the complex-anion $[NO_3.SnBu_2Cl_2{\cdot}H_2O]^-$ a discrete structure with a coordinating water and a monocoordinating nitrate (Figure 2).

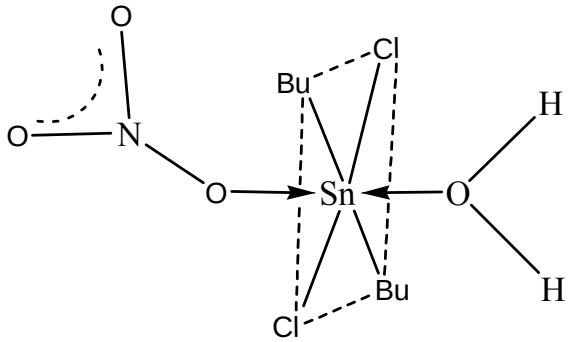

Figure 2. *Proposed structure for the compound* ***B***

When the cation is involved through N-H---O or N-H----Cl hydrogen bonds, suppramolecular architecture is obtained.

CONCLUSION

The studied nitrato adducts have discrete structure with a monocoordinating nitrate, the environment around the tin centre being octahedral or trigonal bipyramidal.
When the cation is involved suppramolecular architectures are obtained.

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REFERENCES

1. Evans, J.C., Karpel, S.: Organotin Compounds in Modern Technology, *Journal of Organometallic Chemistry Library*, **1985**, **16**, Elsevier, Amsterdam;
2. Yin, H.D., Wang, C.H.: Crystallographic report: Crystal and molecular structure of triphenyltin thiazole-2-carboxylate, *Applied Organometallic Chemistry*, **2004**, **18** (8), 411-412;
3. Kapoor, R.N.,Guillory, P., Schulte, L., Cervantes- Lee, F., Haiduc, I., Parkanyi, L., Pannell, K.H.: Di(*p-tert*-butylphenyl)-*N*,*N*-di-(*iso* butyl)carbamoylmethylphosphine oxide and its organotin and uranyl adducts: structural and spectroscopic characterization, *Applied Organometallic Chemistry*, **2005**, **19**, 510-517;
4. Zhang, W.L., Ma, J.F., Jiang, H.: µ-Isophthalato-bis[triphenyltin-(IV)][Sn2(C6H5)6(C8H4O4)], *Acta Crystallographica Section E,* **2006**, **62**, m460 – m461;
5. Chandrasekhar, V., Boomishankar, R., Steiner, A., Bickley, J.F.: First Example of a Hydrogen-Bonded Three-Dimensional Pillared Structure Involving an Organotin Motif: Synthesis and X-ray Crystal Structures of {[nBu2Sn(H2O)3(L)Sn(H2O)3nBu2]2+[L]2-}·2MeOH·2H2O and{[Ph3Sn(L)Sn(H2O)Ph3]n}·THF (L = 1,5-Naphthalenedisulfonate), *Organometallics*,**2003**, **22**, 3342-3344;
6. Herntrich, T., Merzveiler, K.: [(Ph3Sn)3VO4]·CH3CN und [(Ph3Sn)3VO4]·2DMF, TriphenylzinnvanadatemitneuartigenKettenstrukturen, *Zeitschriftfür Anorganische und Allgemeine Chemie*, **2006**, **632** (14), 2341-2344;
7. Pellerito, L., Nagy, L.: Organotin(IV)$^{n+}$ complexes formed with biologically active ligands: equilibrium and structural studies, and some biological aspects, *Coordination Chemistry Reviews*, **2002**, **224** (1-2), 111–150;
8. Allouch, H., Diop, L.: Synthesis and infrared study of some new $SnC_2O_4Cl_2$ adducts and complexes *Scientific Study & Research - Chemistry & Chemical Engineering, Biotechnology, Food Industry,* **2012**, **13** (3), 317-323;
9. Okio, K.Y.A., Diop, L., Russo, U**.:** [Cy2NH2SO4(SnPh3)2X]2 (X = F, Cl): Synthesis and spectroscopic studies, *Scientific Study & Research - Chemistry & Chemical Engineering, Biotechnology, Food Industry*, **2009**, **10** (1), 1-14;
10. Diallo, W., Diassé_Sarr, A., Diop, L., Mahieu, B., Biesemans, M., Willem, R., Kociok-Köhn, G., Molloy,K. C.: X-Ray structure of tetrabutylammonium chlorotrimethyltin hydrogenosulphate: the first cyclic dimer hydrogenosulphato hydrogen bonded adduct, *Scientific Study & Research – Chemistry & Chemical Engineering, Biotechnology, Food Industry*, **2009**, **10** (3), 207-212;
11. Diallo, W., Okio, K.Y.A., Diop, C.A.K., Diop, L., Diop, L.A., Russo, U.: New Selenito Residues Containing Complexes and Adducts: Synthesis and Spectroscopic Studies, *Main Group Metal Chemistry*, **2009**, **32** (2), 93-99;
12. Okio, K.A., Diop, L., Mathieu, B.: Hypophosphinato Organo- and Halotin (IV) Adducts: Synthesis and Spectroscopic Studies, *Main Group Metal Chemistry*, **2010, 33** (4-5)**,** 209–214;
13. De Barros, D., Diop, L., Mahieu, B.: On the existence of « tetrahedral » SnMe2(PhCO2)2 and [SnMe2(PhCO2)3]- in new benzoato adducts: Synthesis and spectroscopic studies, *Main Group Metal Chemistry*, **2009**, **32** (6), 341-344;
14. Diop, T., Diop, L., Michaud, F.: X-ray structure of $Et_4NNO_3.SnPh_2Cl_2$, *Main Group Metal Chemistry*, **2011, 34** (1-2), 27–28;
15. Nakamoto, K.: Infrared and Raman Spectra of Inorganic and Coordination Compounds (Editors: John Wiley and Sons), 5th Edition, **1997**.