Studii şi Cercetări Ştiinţifice 2013, **14** (3), pp. 185 – 188
Chimie şi Inginerie Chimică, Biotehnologii, Industrie Alimentară

Scientific Study & Research
Chemistry & Chemical Engineering, Biotechnology, Food Industry *ISSN 1582-540X*

ORIGINAL RESEARCH PAPER

SYNTHESIS AND INFRARED STUDY OF $3(Me_4N)_2MoO_4.2SnBr_4$ AND $(Me_4N)_2MoO_4.SnBr_4.H_2O$

Alexis Bienvenu Beleke, Libasse Diop*

Université Cheikh Anta Diop, Faculté des Sciences et Techniques Département de Chimie, Laboratoire de Chimie Minérale et Analytique (LACHIMIA), Dakar, Sénégal

*Corresponding author: dlibasse@gmail.com

Received: March, 15, 2013
Accepted: August, 30, 2013

Abstract: On allowing $(Me_4N)_2MoO_4$ to react with $SnBr_4$ in specific ratios $3(Me_4N)_2MoO_4.2SnBr_4$ and $(Me_4N)_2MoO_4.SnBr_4.H_2O$ adducts were obtained. Their infrared studies have been carried out allowing to suggest a discrete and an infinite chain structures.

Keywords: *coordinating sulphate, dimeric structures, NH…O hydrogen bonds, planar $SnMe_3$ residue, tin (IV) polynuclear complex-anion*

INTRODUCTION

Since several years, the organotin chemistry has been subject of big interest due to its growing applications in numerous fields: medicine (antitumour activity), agriculture (pesticides), industry (antifouling paints), etc [1]. Many research groups have been focusing in finding new molecules of this family [2-9]. In our laboratory, studies on the coordinating nature of the oxyanions within organotin (IV) family of compounds have yet been published [10-14].
We initiate in this paper the study of the interactions between $(Me_4N)_2MoO_4$ and $SnBr_4$ in specific ratios which have yielded $3(Me_4N)_2MoO_4.2SnBr_4$ and $(Me_4N)_2MoO_4.SnBr_4.H_2O$ adducts, infrared studies of each compound have been carried out and based on these data structures were suggested.

MATERIALS AND METHODS

$(Me_4N)_2MoO_4$ has been obtained as a powder on neutralizing H_2MoO_4 with a 20 % water solution of Me_4NOH and allowing the water to evaporate at 60 °C. On allowing $(Me_4N)_2MoO_4$ as ethanolic solution to react with $SnBr_4$ as benzene solution respectively in 1/2 and 1/1 ratios, a yellow precipitate is obtained, stirred around two hours and filtered. The analytical data reported below (Table 1), allow suggesting the following formulae: $3(Me_4N)_2MoO_4.2SnBr_4$ for [**A**] and $(Me_4N)_2MoO_4.SnBr_4.H_2O$ for [**B**].

Table 1. *Results of the elemental analyses*

Compound	Chemical formula	Elemental analysis (%)							
		C		H		N		Br	
		calc.	found	calc.	found	calc.	found	calc.	found
A	$3(Me_4N)_2MoO_4.2SnBr_4$	14.28	14.15	3.82	3.81	4.45	4.36	33.96	33.53
B	$(Me_4N)_2MoO_4.SnBr_4.H_2O$	12.11	11.98	3.28	3.25	3.53	3.54	40.39	40.10

The elemental analyses were performed by the laboratory of Microanalyses – University of Padova – Italy. The infrared spectra have been recorded at the University of Padova-Italy- by means of a Perkin Elmer spectrometer using CsI windows, the sample being as Nujol mulls. Infrared data are given in cm^{-1} (IR abbreviations: (vs) very strong, (s) strong, (m) medium, (w) weak, (vw) very weak). All the chemicals were purchased from Aldrich-Germany- and used as such.

RESULTS AND DISCUSSION

Let us consider the infrared data of the studied compounds: $\nu_1 + \nu_3$: 912w, 869m, 829s, 771vs, 700w; $\nu_2 + \nu_4$: 405m, 375m, 368m, 354s; νSn-O: 260w, νasSn-Br_4: 208vs for (**A**);

$\nu_1 + \nu_3$: 906w, 842w, 806s, 775sh; $\nu_2 + \nu_4$: 489s, 476vs, 464vs, 457s; νSn-O: 260vw, νasSn-Br_4: 210vs for (**B**).

The sharpness of $\nu_{as}(SnBr_4)$ in the two adducts indicate D_{4h} symmetry. From the infrared data we suggest discrete [**A**] (Figure 1) and infinite chain [**B**] (Figure 2) structures. The environment around the tin atom is octahedral, the molybdate anion behaving as a monocoordinating and a bridging bidentate ligand.

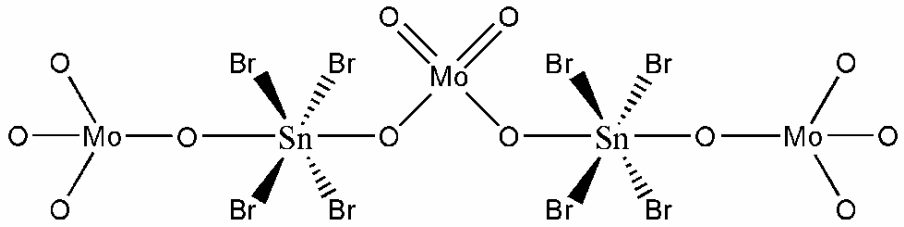

Figure 1. *Proposed structure for* $3(Me_4N)_2MoO_4.2SnBr_4$

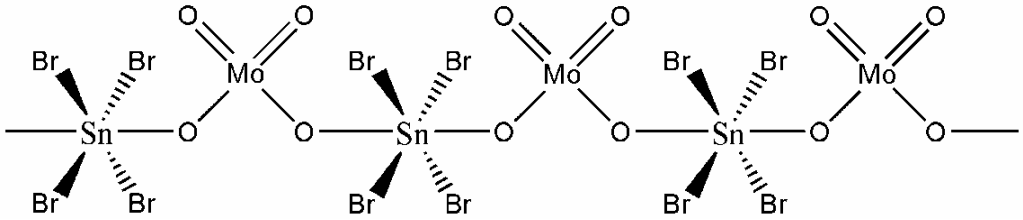

Figure 2. *Proposed structure for* $(Me_4N)_2MoO_4.SnBr_4.H_2O$

CONCLUSIONS

The molybdato adducts studied here have a discrete and an infinite chain structure, the environment around the tin (IV) being octahedral while the molydate anion behaves a monocoordinating or a bridging ligand.

ACKNOWLEDGMENTS

We thank Professor M. Vidali-Padova University, Italy-for equipment support.

REFERENCES

1. Evans, C.J., Karpel, S.: Organotin Compounds in Modern Technology, *Journal of Organometallic Chemistry Library*, **1985**, **16**, Elsevier, Amsterdam;
2. Gielen, M., Bouhdid, A., Kayser, F., Biesemans, M., de Vos, D., Mahieu, B., Willem, R.: Di(n-butyl)tin bis(dihydroxybenzoate)s: Synthesis, spectroscopic characterization and *in vitro* antitumour activity, *Applied Organometalic Chemistry*, **1995**, **9**(3), 251-257;
3. Ng, S.W., Kumar Das, V.G.: Structural studies on triorganostannates derived from dicarboxylic acids. Crystal structure of tetramethylammonium oxalatotriphenylstannate bis(triphenyltin) oxalate, *Journal of Organometallic Chemistry*, **1993**, **456**(2), 175-179;
4. Kamruddin, .S.K., Chattopadhyaya, T.K., Roy, A., Tiekink, E.R.T.: Biocidal Organotin Compounds. Part 2. Synthesis, Characterization and Biocidal Properties of Triorganotin(IV)

Hydantoic Acid Derivatives and the Crystal Structures of Triphenyltin and Tricyclohexyltin Hydantoates, *Applied Organometalic Chemistry*, **1996**, **10** (7), 513-521;
5. 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;
6. Gielen, M.: Tin as a vital nutrient: Implicatiion in Cancer Prophylaxis and Other Physiological processes, Antitumor Active Organotin Compounds, (Editor: Cardelli, N.F), Chapter 13, **1986**, CRC press;
7. Gielen, M.: Organotin compounds and their therapeutic potential: a report from the Organometallic Chemistry Department of the Free University of Brussels, *Applied Organometalic Chemistry*, **2002**, **16**(9), 481-494;
8. Ng, S.W., Kumar Das, V.G., Holecek, J., Lycka, A., Gielen, M., Drew, M.G.B.: Organostannate derivatives of dicyclohexylammonium hydrogen 2,6-pyridinedicarboxylate: solution/solid-state 13C,119Sn NMR and in vitro antitumour activity of bis(dicyclohexylammonium) bis(2,6-pyridinedicarboxylato)dibutylstannate, and the crystal structure of its monohydrate, *Applied Organometalic Chemistry*, **1997**, **11** (1), 39-45;
9. Ma, C.; Zhang, J.: Syntheses and crystal structures of diorganotin(IV) bis(2-pyridinethiolato-N-oxide) complexes, *Applied Organometalic Chemistry*, **2003, 17**(10), 788-794;
10. Diop, C.A.K., Okio, K.Y.A., Diop, L. Mahieu, B.: $R_4NXO_4SnPh_3$ (R = cy, H, Bu, Me; X = S, Se). Synthesis, IR, NMR and Mössbauer Studies, *Main Group Metal Chemistry*, **2000**, **23**(9), 493-496;
11. Diop, C.A.K., Diop, L., Toscano, R.A.: Synthesis, Characterization and X-RAY Structure of Polymeric [Triphenyltin(IV)][Aquatriphenyltin(IV)] Sulphate, $[(Ph_3Sn)(H_2OSnPh_3)SO_4]n$, *Main Group Metal Chemistry*, **2002**, **25**(5), 327-328;
12. Sidibé, M., Lahlou, M., Diop, L., Mahieu, B.: R_2SnA_2, $R_2Sn(Cl)A$, $Me_3Sn(O_2PPh_2)$ (R=Me, Bu; A= Me_2AsO_2, Pn_2PO_2): Synthesis, IR, Raman, Mossbauer and NMR studies, *Main Group Metal Chemistry*,**1998**, **21**(10), 605-608;
13. Okio, K.Y.A., Diop, L., Russo, U.: $[Cy_2NH_2SO_4(SnPh_3)_2X]_2$ (X = F, Cl): Synthesis and spectroscopic studies, *Scientific Study & Research - Chemistry & Chemical Engineering, Biotechnology, Food Industry*, **2009**, **10**(1), 11-14;
14. Diallo, W., Diassé-Sarr, A., Diop, L., Mahieu, B., Biesemans, M., Willem, R., Kociok-Köhn, G., Molloy, K.C.: X-ray structure of tetrabutylammoniumchlorotrimethyltinhydrogenosulphate: the first cyclic dimer hydrogenosulphato hydrogen bonded adduct, *Scientific Study & Research - Chemistry & Chemical Engineering, Biotechnology, Food Industry*, **2009**, **10** (3), 207-212.