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SHORT COMMUNICTION

$SnPh_3OH.Ph_3AsO·H_2O$: SYNTHESIS AND SPECTROSCOPIC STUDIES

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Abstract: On allowing $SnPh_3OH$ to react with Ph_3AsO, the adduct $SnPh_3OH.Ph_3AsO·H_2O$ is obtained, its infrared and Mössbauer studies carried out. The coordination of Ph_3AsO to the tin (IV) centre leads to an infinite chain structure containing a *trans* bipyramidal trigonal SnC_3O_2 arrangement with OH and Ph_3AsO being in apical positions. The water molecule bridges through hydrogen bonds the Lewis base and $SnPh_3OH$.

Keywords: *coordinating Ph_3AsO, hydrogen bonds, IR, Mössbauer, trans coordinated $SnPh_3$ residue*

INTRODUCTION

The focus of the many research groups in tri-organotin(IV) chemistry is mainly due to the several applications found within this family [1 - 5]. In the framework of our search for new organotin compounds, we have initiated here the study of the interactions between $SnPh_3OH$ and Ph_3AsO which have yielded the studied derivative, infrared and Mossbauer studies of which have been carried out and a structure suggested on the basis of spectroscopic data. A question raised up: will $SnPh_3OH$ react as a proton donor through hydrogen bonding or will it behave as a Lewis acid through the tin centre?

MATERIALS AND METHODS

On mixing Ph_3AsO with $SnPh_3OH$ both in ethanol in the 1/1 ratio, a white powder of $SnPh_3OH.Ph_3AsO{\cdot}H_2O$ was obtained after a slow solvent evaporation. The analytical data reported below, allow suggesting the following formula: $HOSnPh_3.Ph_3AsO{\cdot}H_2O$: % C = 59.62 (59.93), H = 4.86 (4.37).

The infrared spectrum has been recorded at the Instituto de Química – U.N.A.M. - Mexico, by means of a BX FT-IR type. C, H, N analyses were performed at the Instituto de Química - U.N.A.M. - Mexico. The Mössbauer spectrum was obtained as described previously [6]. Infrared data are given in cm^{-1} (abbreviations (br) broad, (vs) very strong, (s) strong, (m) medium, (w) weak, (vw) very weak). Mossbauer parameters are given in mm^{-1} (abbreviations: Q.S = quadrupole splitting, I.S = isomer Shift, Γ = full width at half-height, A = area).

All the chemicals were obtained from Aldrich-Germany and used as such.

RESULTS AND DISCUSSION

Let us consider the:

- IR data of $HOSnPh_3.Ph_3AsO{\cdot}H_2O$:

ν OH(H_2O,$SnPh_3OH$) 3425 br; δ OH(H_2O) 1682 s, 1635 s; δ OH($SnPh_3OH$) 985 vs, ν $AsOPh_3$ 864 vs (ep)

- Mossbauer data for $HOSnPh_3.Ph_3AsO{\cdot}H_2O$:

Q.S. = 3.53(± 0.05) $mm{\cdot}s^{-1}$, IS = 1.23(± 0.05) $mm{\cdot}s^{-1}$, Γ = 0.82(± 0.04) $mm{\cdot}s^{-1}$, A (%) = 100(± 1)

On the infrared spectrum of $SnPh_3OH$, δOH appears as a doublet. The widening of νOH is due to the involvement of the OH group in hydrogen bonding. The value of the quadrupole splitting (Q.S = 3.53 $mm{\cdot}s^{-1}$) is an indication of the presence of a trans coordinated $SnPh_3$ residue [7] excluding the interactions through hydrogen bonding involving OH and the oxygen of the Lewis base as one could expect and allow to suggest the structure reported on Figure 1 consisting of the polymerization of $SnPh_3OH.Ph_3AsO$ through H_2O via hydrogen bonds or an oligomer (we have arbitrary chosen the infinite chain).

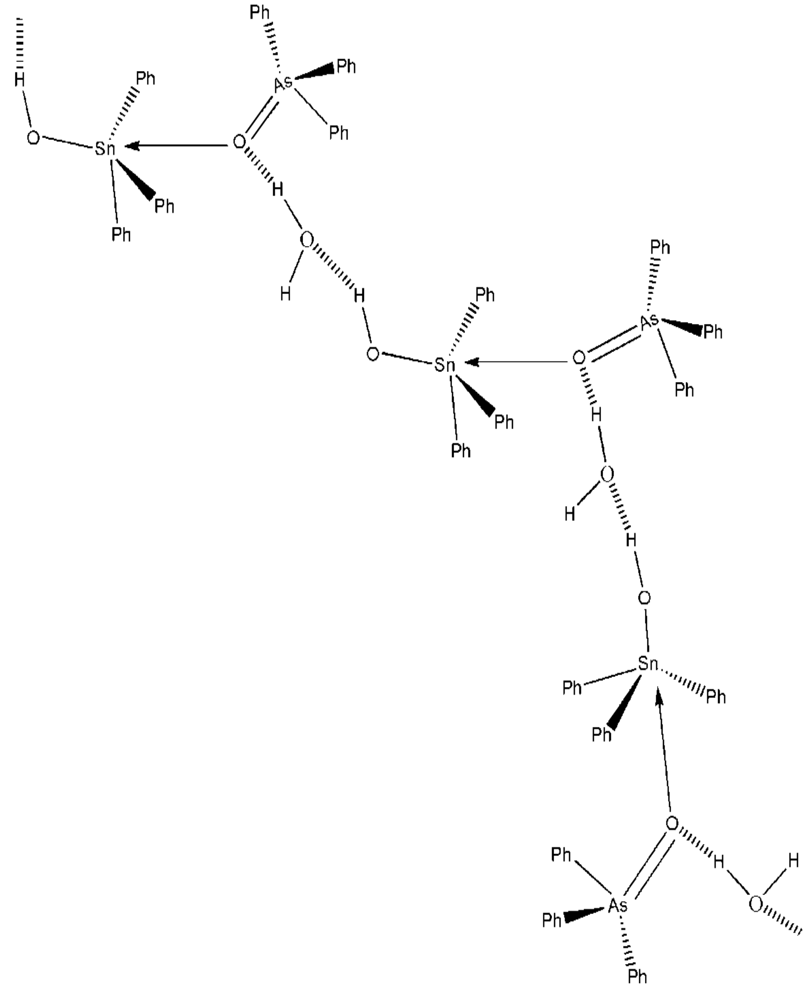

Figure 1. *Proposed structure for the adduct* $HOSnPh_3.Ph_3AsO\cdot H_2O$

CONCLUSION

The adduct $HOSnPh_3.Ph_3AsO.H_2O$ has an infinite chain structure, the tin(IV) center having a dissymmetrical trigonal bipyramidal environment, the OH group and Ph_3AsO group occupying axial positions, the water molecule bridging through hydrogen bonds $HOSnPh_3$ and Ph_3AsO.

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REFERENCES

1. Evans, C. J., Karpel, S.: Agricultural Chemicals and Medical Uses (Chapters 6 and 7), *Organotin Compounds in Modern Technology (Journal of organometallic chemistry library, 16*), Elsevier Science Ltd., Amsterdam, **1985**, 178-215;
2. Gielen, M., Tin as a Vital nutrient: Implication In Cancer Prophylaxis and Other Physiological Processes, Antitumor Active Organotin compounds, Chap.13, (Editor Cardelli, N.F.), C.R.C Press, Boca Raton, **1986**;
3. 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;
4. 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 Organometal Chemistry,* **1993**, **456** (2), 175-179;
5. Ng, S.W., Hook, J. M.: Diisoproprylammonium oxalatotriphenyl stannate, *Acta Crystallographica,* **1999**, **C55**, 310-312;
6. De Sousa, G. F., Deflon, V. M., Gambardella, M. T. do P., Francisco, R. H. P., Ardisson, J. D., Niquet, E.: X-ray crystallographic and Mossbauer spectroscopic applications in dependence of partial quadrupole splitting, [R], on the C-Sn-C angle seven-coordinated diorganotin(IV) complexes. *Inorganic Chemistry,* **2006**, **45** (11), 4518-4525;
7. Bancroft, G. M., Platt, R. H.: Mossbauer Spectra of Inorganic Compounds: Structure and Bonding in *Advanced Inorganic Chemistry and Radiochemistry*, vol. **15**, (Editors Emeleus, H. T., Sharpe, A. G.), Academic Press, NewYork, **1972**, 112.