2ME₄NCO·SnPh₂Cl₂: SPECTROSCOPIC STUDIES
AN UNEXPECTED IONIC STRUCTURE IN SOLID STATE

COCO K. Y. A. OKIO* AND LIBASSE DIOP

* Departamento de Quimica, Facultad de Ciencias, Universidad Nacional de Colombia, Sede-Bogotá, Bogotá, Colombia
Laboratoire de Chimie Minérale et Analytique (LACHIMIA), Département de Chimie, Faculté des Sciences et Techniques, Université Cheikh Anta Diop, Dakar, Sénégal

(Received: February 26, 2008 - Accepted: August 2, 2008)

ABSTRACT

A 2:1 tetramethylurea (TMU) diphenyltin dichloride adduct has been synthesized and characterized by elemental analyses, i.r, NMR and Mössbauer spectroscopies. According to the state of the compound (solid or in solution), the structure is ionic or molecular.

INTRODUCTION

In the framework of our search for new organotin compounds, we carried out the interactions between tetramethylurea and SnPh₂Cl₂. SnPh₂Cl₂-TMU has been isolated.

Materials and Methods

Me₄NCO (Merck) and diphenyltin dichloride (Aldrich chemicals) are used without further purification. The adduct was obtained after slow solvent evaporation from an ethanol solution containing Me₄NCO and PhSnCl₂ in 2:1 molar ratio. The white powder yielded was recrystallized from methanol.

The elemental analyses were performed by the "Service Central d'Analyses" of the "Laboratoire de Chimie Minérale et Analytique (LACHIMIA)" at Université Cheikh Anta Diop, Dakar, Senegal. The i.r and Mössbauer spectra were obtained as described elsewhere. The NMR spectra were recorded in methanol at the "Départamento de Química Física e Química Orgánica", Universidad de Vigo, Spain.

RESULTS AND DISCUSSION

On the i.r spectrum (fig.1), the absence of the band due to νSnC=O expected around 230 cm⁻¹ is an indication of the presence of linear (or almost linear) SnC₂ group. The Mössbauer spectrum (fig.2) shows asymmetric and broad peaks which can be better fitted in two doublets in 1:1 area ratio. The linewidth values (higher than 1.08 mm/s) confirm the presence of more than one single tin site. The two doublets can be ascribed to two different tin centers with similar structural environments. In fact, both QS values (3.90 and 3.71 mm/s) are consistent with a trans hexacoordinated Ph₃Sn residue.

The increase of these values is due to the nature of the cation which contains tin in our case.
All attempts to grow suitable crystals for X-ray diffraction were unsuccessful, but to our best knowledge, it’s the first time, a complex of TMU with a tin adduct presents an ionic structure in the solid state on the basis of Mössbauer and solid state Sn NMR, instead of the neutral one generally founded.

The unexpected ionic structure \([\text{Me}_4\text{N}_2\text{CO}]_2\text{Sn}\)\(^{2+}\)[\(\text{Ph}_2\text{SnCl}_4\)]\(^{2-}\) found in the solid state turns into a molecular structure in solution.

ACKNOWLEDGMENTS

The authors are thankful to the professors Y. Fall (University of Vigo, Spain), K. C. Molloy (University of Bath) and E. Daltrozzo (University of Konstanz, Germany) for equipment support.

REFERENCES