Organotin Carboxylates

[1]M. MAZHAR*, [1]M. AZIZ CHOUDHARY, [1]SAQIB ALI,
[2]XIE QING-LAN AND 2SONG XUEQING
[1]*Department of Chemistry, Quaid-i-Azam University, Islamabad-45320, Pakistan*
[2]*Key National Laboratories of Elemento Organic Chemistry, Nankai University, Tianjin 300071, P.R. China.*

(Received 26th February, 2000, revised 12th March, 2001)

Introduction

Organotin carboxylates, a fertile area of organotin chemistry, have attracted sustained interest in recent years because of their possible commercial applications, potential as antitumor agents [1] and the richness of their structural chemistry [2]. Recently a review high lighting the diversity of tin carboxylate structures was published by Tiekink [3] in which the carboxylate ligand was shown to participate in a myriad of coordination modes, leading to a large variation of structural motifs with different co-ordination numbers and geometries around tin.

The purpose of this bibliographic review is to familiarize the reader with recent developments regarding synthesis, IR. and NMR spectroscopy of organotin carboxylates. The review is arranged so as to highlight; a: various methods of preparation of organotin carboxylates; b: their physical, chemical properties of organotin carboxylates, recent developments in molecular structure determination and to organize spectroscopic data.

Preparation of organotin carboxylates

The following methods are used to prepare organotin carboxylates.

I)Reaction of organotin oxides or hydroxides with carboxylic acids.

A convenient method consists of esterifying the carboxylic acid with an organotin oxide or hydroxide, achieved by azeotropic dehydration of the reactants in boiling benzene or toluene using a Dean and Stark apparatus [4-7].

$$(R_3Sn)_2O + 2R'COOH \longrightarrow 2R_3SnOCOR' + H_2O$$
$$R_3SnOH + R'COOH \longrightarrow R_3SnOCOR' + H_2O$$
$$4R_2SnO + 4R'COOH \longrightarrow \{[R_2Sn(OCOR')_2O]_2\} + 2H_2O$$
$$RSn(O)OH + 3R'COOH \longrightarrow RSn(OCOR')_3 + 2H_2O$$

Using this method organotin derivatives of 3-indolacetic acid (IAA) (1) of general formula R_3Sn (IAA) have been prepared in 55 % yield. Low yields (26%) were obtained when similar complexes were prepared from the reaction of the acid with sodium metal followed by reaction with R_3SnCl. Tributyltinalkyloxy and aryloxy (thio-) acetate were also synthesized [8].

$$(Bu_3Sn)_2O + 2RCH_2CO_2H \longrightarrow 2Bu_3SnO_2CCH_2R + H_2O$$

Tris(methyldiphenylsilylmethyl)tin aliphatic carboxylates and aryloxyacetates were synthesized [9-11] by the reaction of bis(methyldiphenylsilylmethyl)tin oxide with the corresponding carboxylic acid.

$$[(MePh_2SiCH_2)_3Sn]_2O + 2RCOOH \longrightarrow 2(MePh_2SiCH_2)_3Sn(O_2CR) + H_2O$$

Smith *et al.* [12] synthesized triorganostannyl esters of amic acid (N-phenyl-succinamic acid, N,N-diethylphthalamic acid, N-propylphenylmalamic acid and N-ter-butyl-phenyl maleamic acid) in toluene by removing water azeotropically. Alternatively an acetone solution of reactants stored over molecular sieves may be refluxed. This procedure led to products in relatively low yields. Huber [2] synthesized; by refluxing a 2:1 molar mixture of R_3MOH (M = Sn, Pb) and amino acid or 1:1 mixture of $(n\text{-}Bu_3Sn)_2O$ and glutamic acid in boiling CH_3OH. 2,2-Dimethoxypropane was added to remove water of neutralization. These

*To whom all correspondence should be addressed.

workers characterized triorganotin and triorganolead derivatives of aspartic acid and glutamic acid. They examined the behavior of the additional carboxylate group and its structural effect in such amino acid derivatives.

Fourteen different tricyclohexylstananne aromatoxyacetates were prepared by reaction of tricyclohexylstananne hydroxide and aryloxy acetic acid [13].

$$ArOCH_2COOH + (C_6H_{11})_3SnOH \xrightarrow{C_6H_6} ArOCH_2COOSn(C_6H_{11})_3$$

II)Reaction of organotin halides with carboxylic acid metal salts

Organotin compounds of general formula R_3SnL and R_2SnL_2 where R = CH_3, C_2H_5, *n*-C_4H_9, C_6H_{11}, Ph, L = 3-(2-thienyl)-2-propenoic acid and 3-(2-furanyl)-2-propenoic acid were prepared by treating the silver salt of an acid with the respective mono(di) organotin(IV) chlorides in (1:1) or (2:1) molar ratio [14-16]. A typical example is:

$$2R_2SnCl_2 + 2R'COOAg \longrightarrow 2R_2SnOCOR' + 2AgCl$$

R = CH_3, n-C_4H_9, R′ = 3-(2-thienyl)-2-propenoic acid or 3-(2-furanyl)-2-propenoic acid, m-methyl trans-cinnamic and 2-(2,3-dimethylphenyl) amino benzoic acids.

Tri(substituted silylmethylene)tin(IV) carboxylates of unsaturated acids were synthesized by the reaction of the corresponding bis(silylmethylene)stannoxanes with carboxylic acids [17,18]. Xie and Mazhar synthesized [19-23] trialkyltin β-aryl-1-β-triphenylgermylpropionates by the following general reaction.

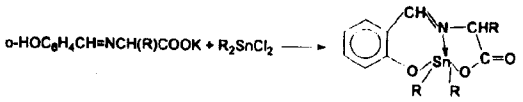
$$Ph_3GeCH(Ar)CH_2COOK + R_3SnCl \longrightarrow Ph_3GeCH(Ar)CH_2COOSnR_3 + KCl$$

Similarly trialkyltin-β-2,8,9-trioxo-5-aza-1-germyltricyclo-(3,3,3,$0^{1,5}$)-undecanyl propio-nates has been described [24]. Many mixed trialkyltin carboxylates are also prepared by this method.

Organotin halides react quantitatively with carboxylic acid metal salts in a suitable organic solvent (in which metal halide can be precipitated) under an inert atmosphere of nitrogen or argon [25,26]. Generally metals Li, Na, K or Ag may be used.

$$R_2SnCl_2 + 2R'COOM \xrightarrow{CHCl_3} R_2Sn(OCOR')_2 + 2MCl$$

Similarly pentaco-ordinated organotin complexes designated as bicycloazastannoxides have been prepared [27].



Sometimes the choice of metal becomes important as noted by Anderson [28] who used silver salts for the efficient synthesis of hydroxyacetate, haloacetate, propionates and propenoates.e.g.

$$(C_2H_5)_3SnI + AgOCOCH_2OH \longrightarrow (C_2H_5)_3SnOCOCH_2OH + AgI$$

All these complexes exhibited limited thermal stability. Sandhu [29] reacted sodium salts of N-acetyl-1-phenylalanine and N-acetyl-1-phenylglycine with various triorganotin compounds in a (3:1) ratio in dry benzene and ethanol to obtain triorganotin derivatives [30,31]. Xie *et al.* synthesized tri (dimethyl-ethylsilylmethylene)tin mono (di) phosphates using potassium organophosphates by the following general method (Scheme 1) [32].

$$\underset{\text{Reactant}}{[C_2H_5(CH_3)_2SiCH_2]_3SnCl + (R_1O)(R_2O)P(X)SK} \longrightarrow \underset{\text{Product}}{[C_2H_5(CH_3)_2SiCH_2]_3SnSP(X)(R_1O)(R_2O)}$$

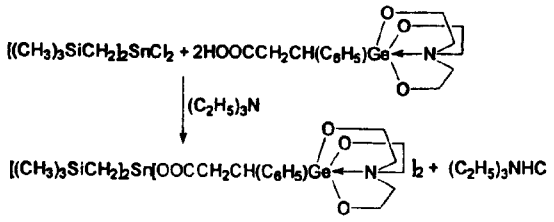
III) Reaction of organotin halides with carboxylic acids in the presence of an auxiliary base

Organotin halides react quantitatively with organic acids in the presence of a suitable base and in a suitable solvent under nitrogen. The choice of a base depends upon type of reaction and product. Commonly used bases are Et_3N, pyridine, K_2CO_3 and NaOH [25,26,33].

$$R_2SnCl_2 + 2RCOOH + 2Et_3N \longrightarrow R_2Sn(OCOR)_2 + 2Et_3NHCl$$

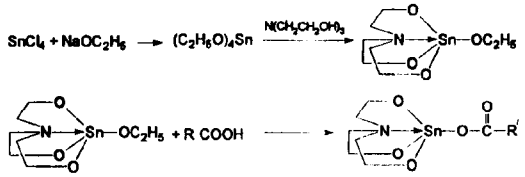
$$(C_6H_{11})_3SnCl + RCOOH \xrightarrow{NaOH/H_2O} (C_6H_{11})_3SnOCOR$$

Similarly diorganotin carboxylates containing silicon and germanium have been synthesized in quantitative yields [34].



Scheme 2

Stannatranecarboxylates have been prepared by reacting of tin tetrachloride, triethanol-amine and an aromatic acid [35].



IV) Redistribution reactions

Diorganohalotin carboxylates may be prepared by redistribution reactions between diorganotindicarboxylates and diorganotindihalide in a suitable organic solvent such as chloroform.

$$R_2SnCl_2 + R_2SnL_2 \longrightarrow 2R_2Sn(L)Cl$$

Organotin compounds of general formula $R_2(X)SnL$ where R = CH_3, C_2H_5, *n*-C_4H_9, Ph, L = trans-3-(2-furanyl)-2-propenoate or trans-3-(3-methylphenyl)-2-propenoate anions and X = Cl have been synthesized by redistribution reactions [36]. On the basis of spectroscopic data, it was suggested that these compounds adopt the cis-R_2 $(X)SnO_2$ geometry.

V) Cleavage of one or more metal carbon bonds in tetraorganotin compounds by a carboxylic acid or mercury(I) carboxylates.

Some uncommon methods of preparation involve cleavage of Sn-C bond [37,38] from tetraorganotin compounds by carboxylic acid or mercury(I) carboxylates to yield organotin carboxylate.

$$R_4Sn + nR'COOH \longrightarrow R_{4-n}Sn(OOCR')_n + nRH$$

$$2(CH_3)_4Sn + Hg_2(OCOR')_2 \longrightarrow 2(CH_3)_3SnOCOR' + 2Hg + C_2H_6$$

VI)Reaction of organotin hydrides with carboxylic acids.

Organotin hydrides react with saturated carboxylic acids to give organotin carboxylates with evolution of hydrogen [39,40].

$$Bu_2SnH_2 + 2CH_3COOH \longrightarrow Bu_2Sn(OOCCH_3)_2 + 2H_2$$

$$Ph_3SnH + EtCOOH \longrightarrow 2\,Ph_3SnOCOEt + H_2$$

A variety of reactions for organotin hydrides are possible, depending largely on the mechanism of Sn-H bond cleavage : with weak nuceophiles the organotin hydride will provide a source of hydride ion leading to the exchange reaction. If a stronger nucleophilic centre such as NR_2 is present in the substrate, the Sn-H moiety release electrophilic hydrogen which is particularly useful in the formation of Sn-Metal bonds. Homolytic cleavage of the Sn-H bond yields organostannyl radicals which may undergo addition reactions with alkynes and alkenes.

$$Me_3SnH + Me_3SnCH{=}CH_2 \longrightarrow Me_3SnCH_2CH_2SnMe_3 + (Me_3Sn)_2CHMe$$

$$Me_3SnH + Me_3SnC{\equiv}CCH_3 \longrightarrow (Me_3Sn)_2C{=}CHCH_3 + Me_3SnCH{=}CCH_3Sn(CH_3)_3$$

Generally in the reaction of organotin hydrides with unsaturated carboxylic acid, hydrostannation supercedes condensation yielding products [24] as shown below.

$$R_3SnH + RCH{=}CHCOOH \longrightarrow R_3SnCHRCH_2COOH + CH_3RCHSnR_3COOH$$

C:.Properties:

Most triorganotin carboxylates are hydrolytically stable whereas diorganotin derivatives undergo partial hydrolysis to form dimeric distannoxanes [41,42]. The mono-organotin tricarboxylates readily dissolve in ethanol to form mono-organotin oxycarboxylates [43].

$$nRSn(OCOR)_3 + nH_2O \longrightarrow (RSnOCOR)_n + 2nRCOOH$$

Spectroscopic investigations show that mono-organotin oxycarboxylates exist as polymers or as oligomers in the solid state with Sn-O-Sn bridges and chelating carboxylic groups [44,45]. The thermal decomposition of triorganotin carboxylates has been used to prepare trialkyltin hydrides, trialkenyltins, triorganocyanomethyltins and perfluorophenyl triphenyltins [46-50].

$$Bu_3SnOOCC{=}CPh_2 \xrightarrow{60^\circ C} Bu_3SnHC{=}CPh_2 + CO_2$$

$$R_3SnOCOCH_2CN \xrightarrow[140\text{-}150^\circ C]{} R_3SnCH_2CN + CO_2$$

$$Ph_3SnOOCR \xrightarrow[Py,\ boiling]{} Ph_3SnR + CO_2$$

R = C_6F_5, C_6F_4OMe, C_6F_4OEt

Mono- di- and triorganotin carboxylates readily exchange with other organotin compounds to form mixed carboxylate derivatives [36].

$$R_2Sn(OCOR)_2 + R_2SnX_2 \longrightarrow 2R_2Sn(OCOCR)(X)$$

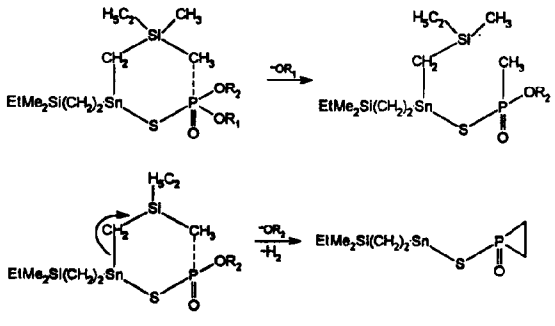
X = H, Halogen or RO

$$Bu_3SnOCOC_5H_4N + RSnCl_3 \xrightarrow{MeOH} RSn(OCOC_5H_4N)Cl_2 + Bu_3SnCl$$

Unsaturated oraganotin acrylates and methacrylates undergo polymerization or copolymerizaion upon heating or by free radical initiation [24].

$$n(CH{=}CH\text{-}CO_2SnR_3) \longrightarrow \left[-CH_2-\underset{\displaystyle CO_2SnR_3}{\underset{|}{CH}}-\right]_n$$

Mass spectra of some tributyltincarboxylates show that the first fragmentation step involves elimination of a butyl group [31]. Further experiments on the mass spectra of (ethyldimethylsilylmethylene)tin mono(di)thiophosphates suggest that the CH_3 group on silicon migrates to phosphorus which eliminates an OR group followed by second methyl group migration from silicon to phosphorus and elimination of hydrogen at phosphorus moiety resulting a trihetrocycle containing phosphorous [32] as shown in the Scheme 3.



Scheme 3

Multinuclear NMR studies on tributyltincarboxylates suggest that absorption frequencies of the carbonyl group markedly depend upon the coordination number of the tin atom. The chemical shifts of ^{119}Sn, ^{13}C and ^{1}J (C-Sn) coupling constant of the compounds show that a small structural change around the tin atom causes a change in the ^{119}Sn chemical shift. For tributyltin arylcarboxylates there is a relationship between the ^{119}Sn chemical shift and Hammett constant of the para-substituent of the arylcarboxylic acid.

$\delta^{119}Sn = 19.11\delta + 110.62$, n = 7, r = 0.9955 [51].

IR and NMR studies on mixed trialkytin derivatives [52] reveal similar behavior to tributyltin arylcarboxylates [53,54]. Some trialkyltin carboxylates are five coordinated bridge polymers while other aromatic carboxylate are four coordinated [55].

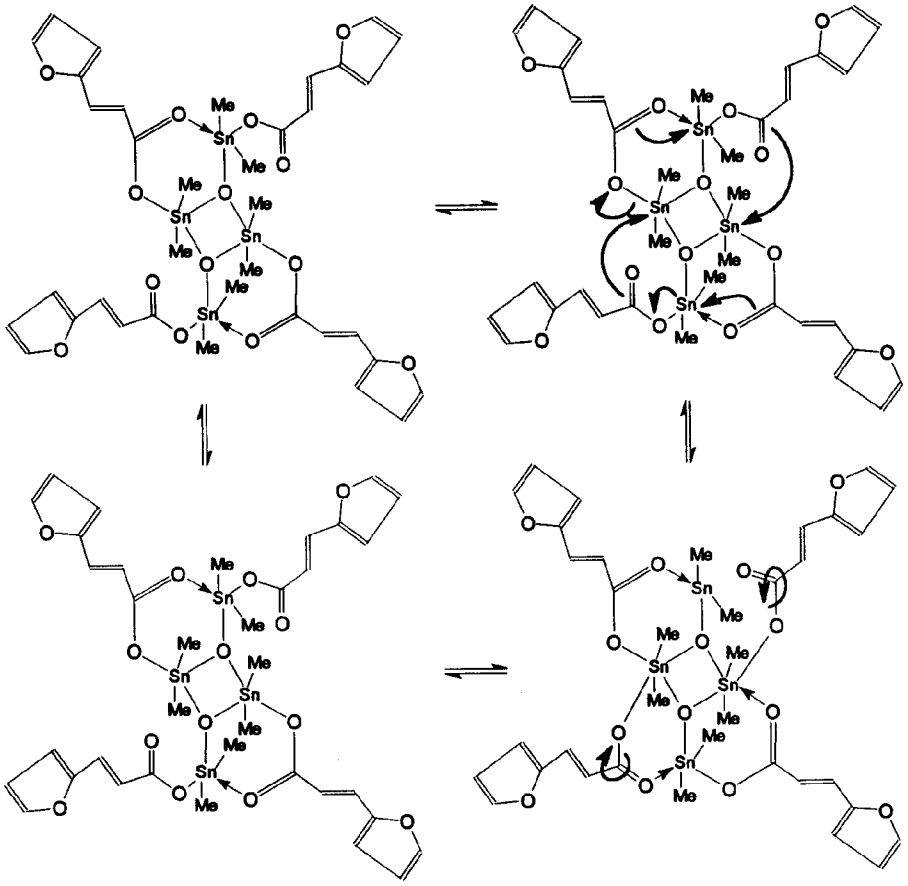
Dynamic equilibrium in dimeric tetraorganotincarboxylato stannoxanes.

Compounds of stoichiometry $[(R_2SnL)_2O]_2$ are commonly known as dimeric tetraorganodicarboxylatostannoxanes. Stannoxanes are dimeric and also have non equivalent tin sites. Multinuclear NMR studies of such compounds in non coordinating solvents suggest two different environments for the R groups linked with endo and exocyclic tin atoms, but with only one environment for the carboxylates moities [7,56-60]. It had been proposed that in solution a dynamic equilibrium exists between various dimeric tetraorganodicarboxylatostannoxanes leading to the equivalence of the carboxylate ligand as shown in Scheme 4.

Furthermore multinuclear NMR studies carried out on diorganotin dicarboxylates prepared by condensation of diorganotinoxides with 2-(2,3-dimethylphenyl)amino benzoic acid, (1:2) molar ratio, also reveals a formation of characteristic dimeric tetraorganodicarboxylato stannoxane structural mode shown in scheme 4 [14].

Structural features in organotin carboxylates

The crystal structure of tricyclohexyltin β-aryl-tri-phenylgermylpropionate $Ph_3GeCH(m\text{-}CH_3C_6H_4)CH_2CO_2Sn(C_6H_{11})_3$ [22] is show n in Fig. 1



Scheme 4

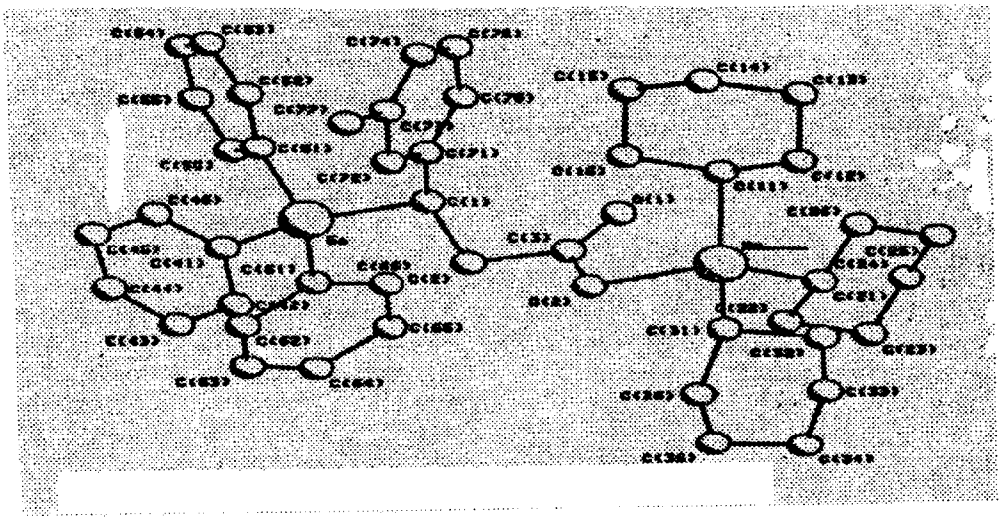


Fig. 1: Molcular structure of $Ph_3GeCH(m\text{-}CH_3C_6H_4)CH_2CO_2Sn(C_6H_{11})_3$

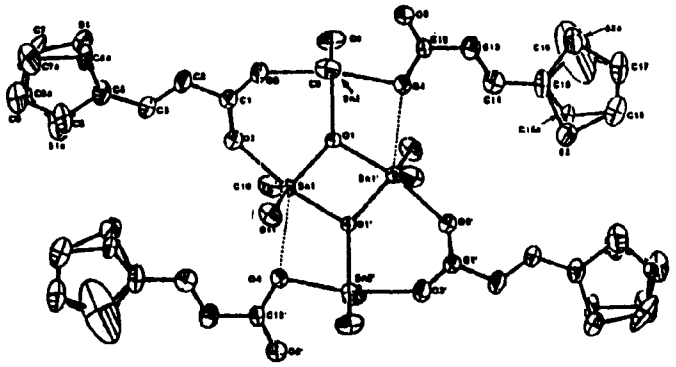


Fig. 2: Dimeric crystal structure of bis[3-(2-thiophenyl)-2-propenoato)-dimethyltin]oxide

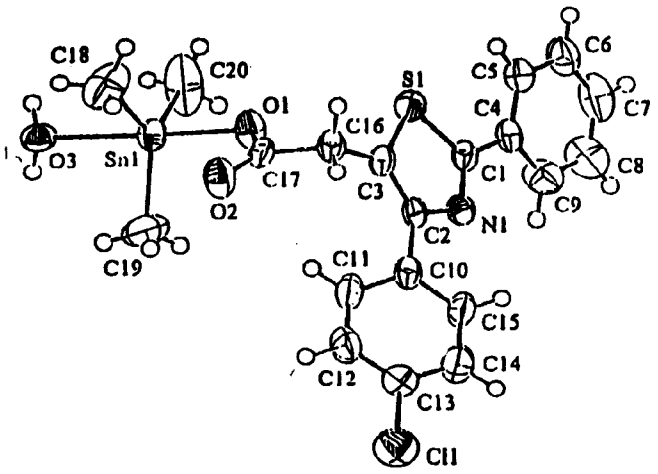


Fig. 3: Crystal structure of $Me_3Sn(CPTA)H_2O$.

The two C-O bond distances of the carboxylic group are 1.19 Å and 1.285 Å, which are typical bond lengths for C=O and C-O groups; the distance between tin and carboxylic oxygen is 2.803 Å., which is longer than the sum of the Van der Waals radii of tin and oxygen, indicating the absence of co-ordinate bonds. The bond angle of 95.4° between C(3)-O-Sn (2) deviates from the standard tetrahedral angle, suggesting distorted tetrahedral environment around Sn(2).

Organotin carboxylates of methyl trans-cinnamic acid [61] are essentially pentacoordinate in the solid state with R_3SnO_2 geometry, but tetracoordinated in non coordinating solvent. Diorganotin dicarboxylates $R_2Sn(O_2CR)_2$ are hexacoordinated in the solid state while there is an equilibrium between the hexa and penta coordinate state in solution. Further, compounds with a (1:1) molar ratio $[(R_2SnO_2CR)_2O]_2$ adopt a characteristic tetra-organodicarboxylatodistannoxane structural mode.

Like triorganotin carboxylates, tetraorganodicarboxylato stannoxanes [15] adopt a polymeric structure in the solid phase. As an example, the crystal structure of bis(3-(2-thienyl)-2-propenoato)dimethyltin)oxide is presented in Fig. 2. The thiophene ring S1, C5, C6, C7 and C4 is staggered with respect to another ring containing S1a, C5a, C6a, C7a and C4a which describes the ring twist under the impact of radiation leading to

Table 1: Analytical data for the organotincarboxylates R_3SnO_2CR'.

	R_3	R'	M.F.	Yield%	m.p
1	Bu_3	$MeOCH_2$	$C_{14}H_{32}O_3Sn$	100	liq.
2	Bu_3	$EtOCH_2$	$C_{15}H_{34}O_3Sn$	100	liq.
3	Bu_3	$n\text{-}PrOCH_2$	$C_{16}H_{36}O_3Sn$	100	liq.
4	Bu_3	$n\text{-}BuOCH_2$	$C_{17}H_{38}O_3Sn$	100	liq.
5	Bu_3	$n\text{-}C_5H_{11}OCH_2$	$C_{18}H_{40}O_3Sn$	100	liq.
6	Bu_3	$n\text{-}C_6H_{13}OCH_2$	$C_{19}H_{40}O_3Sn$	100	liq.
7	Bu_3	$i\text{-}PrOCH_2$	$C_{16}H_{36}O_3Sn$	100	liq.
8	Bu_3	$i\text{-}C_5H_{11}OCH_2$	$C_{18}H_{40}O_3Sn$	100	liq.
9	Bu_3	$\alpha\text{-}C_{10}H_7OCH_2$	$C_{23}H_{36}O_3Sn$	99	liq.
10	Bu_3	$\beta\text{-}C_{10}H_7OCH_2$	$C_{23}H_{36}O_3Sn$	99	liq.
11	Bu_3	$4\text{-}MeC_6H_4OCH_2$	$C_{20}H_{36}O_3Sn$	98	liq.
12	Bu_3	$4\text{-}MeC_6H_4SCH_2$	$C_{20}H_{36}SO_2Sn$	99	liq.
13	$(MePh_2SiCH_2)_3$	Ph	$C_{32}H_{32}O_2Si_3Sn$	86	85-7
14	$(MePh_2SiCH_2)_3$	$4\text{-}MeC_6H_4$	$C_{33}H_{34}O_2Si_3Sn$	89	118-9
15	$(MePh_2SiCH_2)_3$	$4\text{-}MeOC_6H_4$	$C_{33}H_{34}O_3Si_3Sn$	83	137-9
16	$(MePh_2SiCH_2)_3$	$4\text{-}FC_6H_4$	$C_{32}H_{31}FO_2Si_3Sn$	81	127-8
17	$(MePh_2SiCH_2)_3$	$4\text{-}ClC_6H_4$	$C_{32}H_{31}ClO_2Si_3Sn$	77	141-3
18	$(MePh_2SiCH_2)_3$	$4\text{-}IC_6H_4$	$C_{32}H_{31}IO_2Si_3Sn$	84	132-3
19	$(MePh_2SiCH_2)_3$	$4\text{-}NO_2C_6H_4$	$C_{32}H_{31}NO_4Si_3Sn$	77	154-6
20	$(MePh_2SiCH_2)_3$	$4\text{-}NH_2C_6H_4$	$C_{32}H_{33}NO_2Si_3Sn$	82	visc.
21	$(MePh_2SiCH_2)_3$	2- O Me C_6H_4	$C_{33}H_{34}O_3Si_3Sn$	76	125-6
22	$(Me_3SiCH_2)_3$	Ph	$C_{19}H_{38}O_2Si_3Sn$	91	visc.
23	$(Me_3SiCH_2)_3$	$4\text{-}MeC_6H_4$	$C_{20}H_{40}O_2Si_3Sn$	93	visc.
24	$(Me_3SiCH_2)_3$	$4\text{-}MeOC_6H_4$	$C_{20}H_{40}O_3Si_3Sn$	96	visc.
25	$(Me_3SiCH_2)_3$	$4\text{-}FC_6H_4$	$C_{19}H_{37}FO_2Si_3Sn$	95	visc.
26	$(Me_3SiCH_2)_3$	$4\text{-}ClC_6H_4$	$C_{19}H_{37}ClO_2Si_3Sn$	96	visc.
27	$(Me_3SiCH_2)_3$	$4\text{-}NO_2C_6H_4$	$C_{19}H_{37}NO_4Si_3Sn$	91	visc.
28	$(Me_3SiCH_2)_3$	$2\text{-}HOC_6H_4$	$C_{19}H_{38}O_3Si_3Sn$	97	visc.
29	$(Me_3SiCH_2)_3$	$4\text{-}HOC_6H_4$	$C_{19}H_{38}O_3Si_3Sn$	91	visc.
30	$(Me_3SiCH_2)_3$	$2\text{-}MeOC_6H_4$	$C_{20}H_{40}O_3Si_3Sn$	91	visc.
31	$(Me_3SiCH_2)_3$	$3\text{-}MeOC_6H_4$	$C_{20}H_{40}O_3Si_3Sn$	92	visc.
32	$(Me_3SiCH_2)_3$	$4\text{-}BrC_6H_4$	$C_{19}H_{37}BrO_2Si_3Sn$	93	visc.
33	$(Me_3SiCH_2)_3$	$2\text{-}NO_2C_6H_4$	$C_{19}H_{37}NO_4Si_3Sn$	95	visc.
34	$(Me_3SiCH_2)_3$	$3\text{-}NO_2C_6H_4$	$C_{19}H_{37}NO_4Si_3Sn$	97	visc.
35	$(Me_3SiCH_2)_3$	$2,4\text{-}Cl_2C_6H_3$	$C_{19}H_{36}Cl_2O_2Si_3Sn$	98	visc.
36	Bu_2Cy	H	$C_{15}H_{30}O_2Sn$	94	59-60
37	Bu_2Cy	Me	$C_{16}H_{32}O_2Sn$	95	64-66
38	Bu_2Cy	Et	$C_{17}H_{34}O_2Sn$	90	60-62
39	Bu_2Cy	n-Bu	$C_{19}H_{38}O_2Sn$	92	53-55
40	Bu_2Cy	i-Pr	$C_{18}H_{36}O_2Sn$	91	56.57
41	Bu_2Cy	i-Bu	$C_{19}H_{38}O_2Sn$	91	57-59
42	Bu_2Cy	$4\text{-}FC_6H_4$	$C_{21}H_{33}FO_2Sn$	90	Fluid
43	Bu_2Cy	$4\text{-}MeC_6H_4$	$C_{22}H_{36}O_2Sn$	85	Fluid
44	Bu_2Cy	$4\text{-}MeOC_6H_4$	$C_{22}H_{36}O_3Sn$	91	Fluid
45	Bu_2Cy	$2\text{-}MeOC_6H_4$	$C_{22}H_{36}O_3Sn$	86	Fluid
46	Bu_2Cy	$4\text{-}HOC_6H_4$	$C_{21}H_{34}O_3Sn$	73	69-71
47	Bu_2Cy	$4\text{-}NH_2C_6H_4$	$C_{21}H_{35}NO_2Sn$	93	Fluid
48	Bu_2Cy	$3\text{-}MeOC_6H_4$	$C_{22}H_{36}O_3Sn$	95	Fluid
49	Bu_2Cy	$3\text{-}NO_2C_6H_4$	$C_{21}H_{33}NO_4Sn$	96	Fluid
50	Bu_2Cy	$2\text{-}HOC_6H_4$	$C_{21}H_{34}O_3Sn$	92	Fluid
51	Bu_2Cy	$2\text{-}NH_2C_6H_4$	$C_{21}H_{35}NO_2Sn$	91	Fluid
52	Bu_2Cy	$2\text{-}HO,4\text{-}NH_2C_6H_3$	$C_{21}H_{35}NO_3Sn$	94	Fluid
53	Bu_2Cy	C_4H_3O	$C_{19}H_{31}O_3Sn$	9	69-71
54	Bu_2Cy	$Bu\text{-}C_4H_2O$	$C_{23}H_{39}O_3Sn$	93	57-59
55	Bu_2Cy	C_4H_2O	$C_{26}H_{37}O_4Sn$	89	Fluid
56	$(PhMe_2SiCH_2)_3$	$C_6H_5OCH_2$	$C_{35}H_{46}O_3Si_3Sn$	70	visc.
57	$(PhMe_2SiCH_2)_3$	$4\text{-}ClC_6H_4OCH_2$	$C_{35}H_{45}ClO_3Si_3Sn$	85	visc.
58	$(PhMe_2SiCH_2)_3$	$4\text{-}BrC_6H_4OCH_2$	$C_{35}H_{45}BrO_3Si_3Sn$	87	visc.

Table 1: (continued)

	R_3	R'	M.F.	Yield%	m.p
59	$(PhMe_2SiCH_2)_3$	$4\text{-}IC_6H_4OCH_2$	$C_{35}H_{45}IO_3Si_3Sn$	78	visc.
60	$(PhMe_2SiCH_2)_3$	$4\text{-}MeC_6H_4OCH_2$	$C_{36}H_{48}O_3Si_3Sn$	82	visc.
61	$(PhMe_2SiCH_2)_3$	$4\text{-}NO_2C_6H_4OCH_2$	$C_{35}H_{45}NO_5Si_3Sn$	83	visc.
62	$(PhMe_2SiCH_2)_3$	$3\text{-}MeC_6H_4OCH_2$	$C_{36}H_{48}O_3Si_3Sn$	90	visc.
63	$(PhMe_2SiCH_2)_3$	$2\text{-}ClC_6H_4OCH_2$	$C_{35}H_{44}ClO_3Si_3Sn$	90	visc.
64	$(PhMe_2SiCH_2)_3$	$3\text{-}NO_2C_6H_4OCH_2$	$C_{35}H_{45}NO_5Si_3Sn$	86	visc.
65	$(PhMe_2SiCH_2)_3$	$2\text{-}MeC_6H_4OCH_2$	$C_{36}H_{48}O_3Si_3Sn$	81	visc.
66	$(PhMe_2SiCH_2)_3$	$2,4\text{-}Cl_2C_6H_3OCH_2$	$C_{35}H_{44}Cl_2O_3Si_3Sn$	88	visc.
67	$(PhMe_2SiCH_2)_3$	$2,4,6\text{-}Cl_3C_6H_2OCH_2$	$C_{35}H_{43}Cl_3O_3Si_3Sn$	89	visc.
68	$(PhMe_2SiCH_2)_3$	$2\text{-}MeO\text{-}4\text{-}CH_2{=}CHCH_2C_6H_3OCH_2$	$C_{39}H_{52}O_4Si_3Sn$	89	visc.
69	$(PhMe_2SiCH_2)_3$	$MeOCH_2$	$C_{30}H_{44}O_3Si_3Sn$	73	visc.
70	$(PhMe_2SiCH_2)_3$	$EtOCH_2$	$C_{31}H_{46}O_3Si_3Sn$	89	visc.
71	$(PhMe_2SiCH_2)_3$	$n\text{-}PrOCH_2$	$C_{32}H_{48}O_3Si_3Sn$	90	visc.
72	$(PhMe_2SiCH_2)_3$	$n\text{-}BuOCH_2$	$C_{33}H_{50}O_3Si_3Sn$	88	visc.
73	$(PhMe_2SiCH_2)_3$	$N\text{-}C_5H_{11}OCH_2$	$C_{34}H_{52}O_3Si_3Sn$	89	visc.
74	$(PhMe_2SiCH_2)_3$	$4\text{-}MeOC_6H_4$	$C_{35}H_{46}O_3Si_3Sn$	92	visc.
75	$(PhMe_2SiCH_2)_3$	Ph	$C_{34}H_{44}O_2Si_3Sn$	87	visc.
76	$(PhMe_2SiCH_2)_3$	$4\text{-}FC_6H_4$	$C_{34}H_{43}FO_2Si_3Sn$	87	visc.
77	$(PhMe_2SiCH_2)_3$	$4\text{-}ClC_6H_4$	$C_{34}H_{43}ClO_2Si_3Sn$	88	visc.
78	$(PhMe_2SiCH_2)_3$	$4\text{-}BrC_6H_4$	$C_{34}H_{43}BrO_2Si_3Sn$	88	visc.
79	$(PhMe_2SiCH_2)_3$	$4\text{-}NO_2C_6H_4$	$C_{34}H_{42}NO_4Si_3Sn$	92	
80	$(PhMe_2SiCH_2)_3$	$2\text{-}MeOC_6H_4$	$C_{35}H_{46}O_3Si_3Sn$	96	
81	$(PhMe_2SiCH_2)_3$	OCH=CHCH=C-	$C_{32}H_{42}O_3Si_3Sn$	88	
82	Cy_2Me	H	$C_{14}H_{26}O_2Sn$	99	
83	Cy_2Me	Me	$C_{15}H_{28}O_2Sn$	94	
84	Cy_2Me	Et	$C_{16}H_{30}O_2Sn$	80	
85	Cy_2Me	n-Pr	$C_{17}H_{32}O_2Sn$	90	
86	Cy_2Me	n-Bu	$C_{18}H_{34}O_2Sn$	84	
87	Cy_2Me	$n\text{-}C_5H_{11}$	$C_{19}H_{36}O_2Sn$	93	
88	Cy_2Me	i-Pr	$C_{17}H_{32}O_2Sn$	98	
89	Cy_2Me	i-Bu	$C_{18}H_{34}O_2Sn$	99	
90	Cy_2Me	Ph	$C_{20}H_{30}O_2Sn$	96	
91	Cy_2Me	$4\text{-}ClC_6H_4$	$C_{20}H_{29}NO_2Sn$	93	
92	Cy_2Me	$4\text{-}NO_2C_6H_4$	$C_{20}H_{29}NO_4Sn$	96	
93	Cy_2Me	$4\text{-}MeOC_6H_4$	$C_{21}H_{32}O_3Sn$	92	
94	Cy_2Me	$4\text{-}HOC_6H_4$	$C_{20}H_{30}O_3Sn$	90	
95	Cy_2Me	$4\text{-}MeC_6H_4$	$C_{21}H_{32}O_2Sn$	96	
96	Cy_2Me	$4\text{-}NH_2C_6H_4$	$C_{20}H_{31}NO_2Sn$	80	
97	Cy_2Me	$4\text{-}FC_6H_4$	$C_{20}H_{29}FO_2Sn$	88	
98	Cy_2Me	$2,4\text{-}Cl_2C_6H_3$	$C_{20}H_{28}Cl_2O_2Sn$	96	
99	Cy_2Me	$2,4\text{-}Cl_2C_6H_3OCH_2$	$C_{21}H_{30}O_3Sn$	89	
100	$(Ph_2MeSiCH_2)_3$	Me	$C_{44}H_{48}O_2Si_3Sn$	91	—
101	$(Ph_2MeSiCH_2)_3$	Et	$C_{45}H_{50}O_2Si_3Sn$	93	—
102	$(Ph_2MeSiCH_2)_3$	n-Pr	$C_{46}H_{52}O_2Si_3Sn$	89	—
103	$(Ph_2MeSiCH_2)_3$	n-Bu	$C_{47}H_{54}O_2Si_3Sn$	87	—
104	$(Ph_2MeSiCH_2)_3$	$n\text{-}C_5H_{11}$	$C_{48}H_{56}O_2Si_3Sn$	88	—
105	$(Ph_2MeSiCH_2)_3$	$n\text{-}C_6H_{13}$	$C_{49}H_{58}O_2Si_3Sn$	85	—
106	$(Ph_2MeSiCH_2)_3$	$n\text{-}C_8H_{17}$	$C_{51}H_{62}O_2Si_3Sn$	91	—
107	$(Ph_2MeSiCH_2)_3$	$n\text{-}C_{10}H_{21}$	$C_{53}H_{66}O_2Si_3Sn$	92	—
108	$(Ph_2MeSiCH_2)_3$	*	$C_{46}H_{48}O_3Si_3Sn$	72	87-88
109	$(Ph_2MeSiCH_2)_3$	$PhOCH_2$	$C_{50}H_{52}O_3Si_3Sn$	81	133-134
110	$(Ph_2MeSiCH_2)_3$	$4\text{-}MeC_6H_4OCH_2$	$C_{51}H_{54}O_3Si_3Sn$	82	
111	$(Ph_2MeSiCH_2)_3$	$4\text{-}ClC_6H_4OCH_2$-	$C_{50}H_{51}ClO_3Si_3Sn$	86	105-107
112	$(Ph_2MeSiCH_2)_3$	$2\text{-}ClC_6H_4OCH_2$	$C_{50}H_{51}ClO_3Si_3Sn$	85	126-128
113	$(Ph_2MeSiCH_2)_3$	$4\text{-}BrC_6H_4OCH_2$	$C_{50}H_{51}BrO_3Si_3Sn$	83	132-33
114	$(Ph_2MeSiCH_2)_3$	$4\text{-}IC_6H_4OCH_2$	$C_{50}H_{51}IO_3Si_3Sn$	83	142-143
115	$(Ph_2MeSiCH_2)_3$	$4\text{-}NO_2C_6H_4OCH_2$	$C_{50}H_{51}CNO_5Si_3Sn$	91	

Table 1: (continued)

	R_3	R′	M.F.	Yield%	m.p
116	$(Ph_2MeSiCH_2)_3$	$2,4\text{-}Cl_2C_6H_3OCH_2$	$C_{50}H_{50}Cl_2O_3Si_3Sn$	78	112-113
117	$(Ph_2MeSiCH_2)_3$	$2,4,6\text{-}Cl_3C_6H_2CH_2$	$C_{50}H_{49}Cl_3O_3Si_3Sn$	89	—
118	Cy_3	n-Pr	$C_{22}H_{40}O_2Sn$	78	126-128
119	Cy_3	n-Bu	$C_{23}H_{42}O_2Sn$	70	64-66
120	Cy_3	$n\text{-}C_5H_{11}$	$C_{24}H_{44}O_2Sn$	75	44-46
121	Cy_3	$CH_2CH(Me)_2$	$C_{23}H_{42}O_2Sn$	57	117-118
122	Cy_3	$CH(Ph)_2$	$C_{32}H_{42}O_2Sn$	57	76.78
123	Cy_3	$p\text{-}MeC_6H_4$	$C_{26}H_{40}O_2Sn$	79	71.73
124	Cy_3	$o\text{-}MeOC_6H_4$	$C_{26}H_{40}O_3Sn$	27	69-71
125	Cy_3	$m\text{-}MeOC_6H_4$	$C_{26}H_{40}O_3Sn$	39	80-82
126	Cy_3	$p\text{-}NO_2C_6H_4$	$C_{25}H_{37}NO_4Sn$	83	84-86
127	Cy_3	$o\text{-}PhNHC_6H_4$	$C_{31}H_{43}NO_2Sn$	40	80-82
128	Cy_3	$m\text{-}FC_6H_4$	$C_{25}H_{37}FO_2Sn$	48	68.70
129	Cy_3	$P\text{-}FC_6H_4$	$C_{25}H_{37}FO_2Sn$	37	78-80
130	Cy_3	$o\text{-}ClC_6H_4$	$C_{25}H_{37}ClO_2Sn$	73	82-84
131	Cy_3	$m\text{-}ClC_6H_4$	$C_{25}H_{37}ClO_2Sn$	59	72-74
132	Cy_3	$P\text{-}ClC_6H_4$	$C_{25}H_{37}ClO_2Sn$	13	80-82
133	Cy_3	$m\text{-}BrC_6H_4$	$C_{25}H_{37}BrO_2Sn$	49	76-78
134	Cy_3	$o\text{-}IC_6H_4$	$C_{25}H_{37}IO_2Sn$	41	64-66
135	Cy_3	$m\text{-}IC_6H_4$	$C_{25}H_{37}IO_2Sn$	20	74-76
136	Cy_3	$p\text{-}IC_6H_4$	$C_{25}H_{37}IO_2Sn$	73	59-61
137	Cy_3	$PhOCH_2$	$C_{26}H_{40}O_3Sn$	49	61-63
138	Cy_3	$2\text{-}ClC_6H_4OCH_2$	$C_{26}H_{39}ClO_3Sn$	23	63-65
139	Cy_3	$3\text{-}ClC_6H_4OCH_2$	$C_{26}H_{39}ClO_3Sn$	49	57-58
140	Cy_3	$4\text{-}ClC_6H_4OCH_2$	$C_{26}H_{39}ClO_3Sn$	61	65-67
141	Cy_3	$2,4\text{-}Cl_2C_6H_3OCH_2$	$C_{26}H_{38}Cl_2O_3Sn$	73	70-72
142	Cy_3	$2,4,6\text{-}Cl_3C_6H_2\ OCH_2$	$C_{26}H_{37}Cl_3O_3Sn$	34	64-66
143	Cy_3	$4\text{-}BrC_6H_4OCH_2$	$C_{26}H_{39}BrO_3Sn$	86	84-86
144	Cy_3	$4\text{-}IC_6H_4OCH_2$	$C_{26}H_{39}IO_3Sn$	49	101-102
145	Cy_3	$2\text{-}MeC_6H_4OCH_2$	$C_{27}H_{42}O_3Sn$	57	49-51
146	Cy_3	$3\text{-}MeC_6H_4OCH_2$	$C_{27}H_{42}O_3Sn$	69	57-58
147	Cy_3	$4\text{-}MeC_6H_4OCH_2$	$C_{30}H_{46}O_4Sn$	91	58-59
148	Cy_3	$3\text{-}NO_2C_6H_4OCH_2$	$C_{30}H_{46}O_4Sn$	31	77-79
149	Cy_3	$4\text{-}NO_2C_6H_4OCH_2$	$C_{26}H_{39}O_4Sn$	93	83-85
150	Cy_3	2-MeO 4-CH_2 = $CHCH_2C_6H_3OCH_2$	$C_{30}H_{46}O_4Sn$	45	56-58
151	Cy_2Me	$C_6H_5OCH_2$	$C_{21}H_{32}O_3Sn$	94	76-78
152	Cy_2Me	$4\text{-}MeC_6H_4OCH_2$	$C_{22}H_{34}O_3Sn$	91	69-71
153	Cy_2Me	$2\text{-}MeC_6H_4OCH_2$	$C_{22}H_{34}O_3Sn$	91	72-74
154	Cy_2Me	$3\text{-}MeC_6H_4OCH_2$	$C_{22}H_{34}O_3Sn$	90	86-88
155	Cy_2Me	$3,5\text{-}Me_2C_6H_3OCH_2$	$C_{23}H_{36}O_3Sn$	93	98-100
156	Cy_2Me	$2,4\text{-}Me_2C_6H_3OCH_2$	$C_{23}H_{36}O_3Sn$	92	69-71
157	Cy_2Me	$3,4\text{-}Me_2C_6H_3OCH_2$	$C_{23}H_{36}O_3Sn$	94	120-122
158	Cy_2Me	$2,3Me_2C_6H_3OCH_2$	$C_{23}H_{36}O_3Sn$	92	105-107
159	Cy_2Me	$2,6\text{-}Me_2C_6H_3OCH_2$	$C_{23}H_{36}O_3Sn$	91	45-47
160	Cy_2Me	$4\text{-}MeOC_6H_4OCH_2$	$C_{22}H_{36}O_5Sn$	92	55-57
161	Cy_2Me	$2\text{-}MeOC_6H_4OCH_2$	$C_{22}H_{34}O_4Sn$	95	78-80
162	Cy_2Me	2-MeO,4-CH_2=CH-$CH_2C_6H_4OCH_2$	$C_{25}H_{40}O_5Sn$	94	63-65
163	Cy_2Me	$4\text{-}ClC_6H_4OCH_2$	$C_{21}H_{31}ClO_3Sn$	94	90-92
164	Cy_2Me	$2\text{-}ClC_6H_4OCH_2$	$C_{21}H_{31}ClO_3Sn$	93	95-97
165	Cy_2Me	$3\text{-}ClC_6H_4OCH_2$	$C_{21}H_{31}ClO_3Sn$	93	96-98
166	Cy_2Me	$2,4,5\text{-}Cl_3C_6H_2OCH_2$	$C_{21}H_{29}Cl_3O_3Sn$	91	102-104
167	Cy_2Me	$4\text{-}BrC_6H_4OCH_2$	$C_{21}H_{31}BrO_3Sn$	95	96-98
168	Cy_2Me	$2\text{-}BrC_6H_4OCH_2$	$C_{21}H_{31}BrO_3Sn$	94	108-110
169	Cy_2Me	$4\text{-}IC_6H_4OCH_2$	$C_{21}H_{31}IO_3Sn$	94	88-90
170	Cy_2Me	$3\text{-}NO_2C_6H_4OCH_2$	$C_{21}H_{31}NO_5Sn$	93	116-118
171	Cy_3	*[Ge]CHR^1CH_2 R^1=H	$C_{27}H_{49}NO_5GeSn$	65	197-8

Table 1: (continued)

	R_3	R'	M.F.	Yield%	m.p
172	Ph_3	^{a}[Ge]CHR^1CH_2 R^1=H	$C_{27}H_{31}NO_5GeSn$	74	150-151
173	Bu_3	^{a}[Ge]CHR^1CH_2 R^1=H	$C_{21}H_{43}NO_5GeSn$	90	83-84
174	Bu_3	^{a}[Ge]CHR^1CH_2 R^1= Ph	$C_{27}H_{47}NO_5GeSn$	87	103-104
175	Bu^n_2Cy	^{a}[Ge]CHR^1CH_2 R^1= Ph	$C_{29}H_{49}NO_5GeSn$	60	124-126
176	Bu^nCy_2	^{a}[Ge]CHR^1CH_2 R^1= Ph	$C_{31}H_{51}NO_5GeSn$	77	151-152
177	Cy_3	^{a}[Ge]CHR^1CH_2 R^1= Ph	$C_{33}H_{53}NO_5GeSn$	85	198-99
178	Bu_3	^{a}[Ge]CHR^1CH_2 R^1= p MeC_6H_4	$C_{28}H_{49}NO_5GeSn$	74	123-124
179	Bu^n_2Cy	^{a}[Ge]CHR^1CH_2 R^1= p MeC_6H_4	$C_{30}H_{51}NO_5GeSn$	81	142-143
180	Bu^nCy_2	^{a}[Ge]CHR^1CH_2 R^1= p MeC_6H_4	$C_{32}H_{53}NO_5GeSn$	76	171-173
181	Cy_3	^{a}[Ge]CHR^1CH_2 R^1= p MeC_6H_4	$C_{34}H_{35}NO_5GeSn$	76	198-199
182	Bu_3	^{a}[Ge]CHR^1CH_2 R^1= p ClC_6H_4	$C_{27}H_{46}ClNO_5GeSn$	75	114-116
183	Bu^n_2Cy	^{a}[Ge]CHR^1CH_2 R^1= p ClC_6H_4	$C_{29}H_{48}ClNO_5GeSn$	78	138-40
184	Bu^nCy_2	^{a}[Ge]CHR^1CH_2 R^1= p-ClC_6H_4	$C_{31}H_{50}ClNO_5GeSn$	68	174-175
185	Cy_3	^{a}[Ge]CHR^1CH_2 R^1= p ClC_6H_4	$C_{33}H_{52}ClNO_5GeSn$	77	198-200
186	$MeCy_2$	$MeOCH_2$	$C_{16}H_{30}O_3Sn$	95	65-67
187	$MeCy_2$	$EtOCH_2$	$C_{17}H_{32}O_3Sn$	95	50-52
188	$MeCy_2$	n-$PrOCH_2$	$C_{18}H_{34}O_3Sn$		-
189	$MeCy_2$	i-$PrOCH_2$	$C_{18}H_{34}O_3Sn$		-
190	$MeCy_2$	n-$BuOCH_2$	$C_{19}H_{36}O_3Sn$	96	56-58
191	$MeCy_2$	n-$C_5H_{11}OCH_2$	$C_{20}H_{38}O_3Sn$	94	48-50
192	$MeCy_2$	n-$C_6H_{13}OCH_2$	$C_{21}H_{40}O_3Sn$	95	-
193	$MeCy_2$	n-$C_8H_{17}OCH_2$	$C_{22}H_{42}O_3Sn$	95	-
194	$MeCy_2$	-$C_{10}H_8OCH_2$	$C_{24}H_{33}O_3Sn$	91	83-85
195	$MeCy_2$	2,4-$Cl_2C_6H_3OCHMe$	$C_{22}H_{32}Cl_2O_3Sn$	96	66-68
196	$MeCy_2$	2,4-$Br_2C_6H_3OCHMe$	$C_{22}H_{32}Br_2O_3Sn$	96	76-78
197	$MeCy_2$	C_6H_{11}	$C_{19}H_{34}O_2Sn$	91	71-74
198	$MeCy_2$	$C_6H_5CH_2$	$C_{20}H_{30}O_2Sn$	92	60-62
199	$MeCy_2$	$MeCONHCH_2$	$C_{17}H_{29}NO_3Sn$	82	146-148
200	$MeCy_2$	$MeSCH_2CH_2CH(NH_2)$	$C_{18}H_{33}NSO_2Sn$	62	77-80
201	$MeCy_2$	$MeCH(NH_2)$	$C_{16}H_{31}NO_2Sn$	73	121-123
202	$MeCy_2$	HO_2CCH=CH	$C_{17}H_{28}O_4Sn$	84	135-137
203	$Cy_2(PhMe_2SiCH_2)$	Ph	$C_{28}H_{40}SiO_2Sn$	85	visc.
204	$Cy_2(PhMe_2SiCH_2)$	4-MeC_6H_4	$C_{29}H_{42}SiO_2Sn$	99	visc.
205	$Cy_2(PhMe_2SiCH_2)$	4-ClC_6H_4	$C_{28}H_{39}ClSiO_2Sn$	89	visc.
206	$Cy_2(PhMe_2SiCH_2)$	4-FC_6H_4	$C_{28}H_{39}FSiO_2Sn$	91	visc.
207	$Cy_2(PhMe_2SiCH_2)$	4-$NO_2C_6H_4$	$C_{28}H_{39}NSiO_4Sn$	95	visc.
208	$Cy_2(PhMe_2SiCH_2)$	4-$MeOC_6H_4$	$C_{29}H_{42}SiO_3Sn$	92	visc.
209	$Cy_2(PhMe_2SiCH_2)$	4-$NH_2C_6H_4$	$C_{28}H_{41}NSiO_2Sn$	86	visc.
210	$Cy_2(PhMe_2SiCH_2)$	4-$NO_2C_6H_4OCH_2$	$C_{29}H_{41}NSiO_5Sn$	85	visc.
211	$Cy_2(PhMe_2SiCH_2)$	4-$MeC_6H_4OCH_2$	$C_{30}H_{44}SiO_3Sn$	81	visc.
212	$Cy_2(PhMe_2SiCH_2)$	4-$MeOC_6H_4OCH_2$	$C_{30}H_{44}SiO_4Sn$	94	visc.
213	$Cy_2(PhMe_2SiCH_2)$	4-$BrC_6H_4OCH_2$	$C_{29}H_{41}BrSiO_3Sn$	83	visc.
214	$Cy_2(PhMe_2SiCH_2)$	4-$IC_6H_4OCH_2$	$C_{29}H_{41}ISiO_3Sn$	65	visc.
215	$Cy_2(PhMe_2SiCH_2)$	3-$ClC_6H_4OCH_2$	$C_{29}H_{41}ClSiO_3Sn$	63	visc.
216	$Cy_2(PhMe_2SiCH_2)$	3-$MeC_6H_4OCH_2$	$C_{30}H_{44}SiO_3Sn$	78	visc.

Table 1: (continued)

	R_3	R'	M.F.	Yield%	m.p
217	$Cy_2(PhMe_2SiCH_2)$	SC=CH-CH=CH	$C_{26}H_{38}SSiO_2Sn$	86	visc.
218	$Cy_2(PhMe_2SiCH_2)$	OC=CH-CH=CH	$C_{26}H_{38}SiO_3Sn$	75	visc.
219	$Cy_2(PhMe_2SiCH_2)$	OC=CH-CH=CBu	$C_{30}H_{46}SiO_3Sn$	97	visc.
220	$BuCy_2$	H	$C_{17}H_{32}O_2Sn$	95	129-130
221	$BuCy_2$	Me	$C_{18}H_{34}O_2Sn$	94	57-59
222	$BuCy_2$	Et	$C_{19}H_{36}O_2Sn$	91	45-48
223	$BuCy_2$	n-Bu	$C_{21}H_{40}O_2Sn$	98	64-66
224	$BuCy_2$	i-Pr	$C_{20}H_{38}O_2Sn$	95	80-81
225	$BuCy_2$	i-Bu	$C_{21}H_{40}O_2Sn$	93	71-73
226	$BuCy_2$	$4\text{-}MeC_6H_4$	$C_{24}H_{38}O_2Sn$	90	fluid
227	$BuCy_2$	$4\text{-}MeOC_6H_4$	$C_{24}H_{38}O_3Sn$	90	fluid
228	$BuCy_2$	$3\text{-}NO_2C_6H_4$	$C_{28}H_{35}NO_4Sn$	98	fluid
229	$BuCy_2$	$3\text{-}MeOC_6H_4$	$C_{24}H_{38}O_3Sn$	94	fluid
230	$BuCy_2$	$4\text{-}NH_2C_6H_4$	$C_{23}H_{37}NO_2Sn$	91	fluid
231	$BuCy_2$	$2\text{-}MeOC_6H_4$	$C_{24}H_{38}O_3Sn$	89	81-82
232	$BuCy_2$	$4\text{-}HOC_6H_4$	$C_{23}H_{36}O_3Sn$	85	108-111
233	$BuCy_2$	$2\text{-}HO,4\text{-}NH_2C_6H_3$	$C_{23}H_{37}NO_3Sn$	97	fluid
234	$BuCy_2$	$2\text{-}HOC_6H_4$	$C_{23}H_{36}O_3Sn$	93	fluid
235	$BuCy_2$	$2\text{-}IC_6H_4$	$C_{23}H_{35}IO_2Sn$	90	58-60
236	$BuCy_2$	$2\text{-}NH_2C_6H_4$	$C_{23}H_{37}NO_2Sn$	98	fluid
237	$BuCy_2$	$2\text{-}ClC_6H_4$	$C_{23}H_{35}ClO_2Sn$	96	60-62
238	$BuCy_2$	OC=CH-CH=CH	$C_{21}H_{34}O_3Sn$	96	82-85
239	$BuCy_2$	OC=CH-CH=CBu	$C_{25}H_{42}O_3Sn$	91	52-55
240	Bu_3	$Ph_3GeCHArCH_2C$ Ar=Ph	$C_{45}H_{56}O_2GeSn$	76	128-129
241	Bu_3	$Ph_3GeCHArCH_2C$ $Ar=4\text{-}MeC_6H_4$	$C_{48}H_{58}O_2GeSn$	82	155-156
242	Bu_3	$Ph_3GeCHArCH_2C$ $Ar=4\text{-}ClC_6H_4$	$C_{45}H_{55}O_2ClGeSn$	60	136-138
243	Bu_3	$Ph_3GeCHArCH_2C$ $Ar=3\text{-}PhOC_6H_4$	$C_{51}H_{50}O_3GeSn$	70	138-140
244	Bu_3	$Ph_3GeCHArCH_2C$ $Ar=4\text{-}MeOC_6H_4$	$C_{46}H_{58}O_3GeSn$	81	84-86
245	Bu_3	$Ph_3GeCHArCH_2C$ $Ar=2\text{-}MeOC_6H_4$	$C_{46}H_{58}O_3GeSn$	86	110-112
246	Bu_3	$Ph_3GeCHArCH_2C$ $Ar=2\text{-}ClC_6H_4$	$C_{45}H_{55}O_2ClGeSn$	78	138-139
247	Bu_3	$Ph_3GeCHArCH_2C$ $Ar=4\text{-}FC_6H_4$	$C_{45}H_{55}O_2FGeSn$	86	118-119
248	Bu_3	$Ph_3GeCHArCH_2C$ $Ar=2\text{-}MeC_6H_4$	$C_{45}H_{58}O_2GeSn$	96	156-157
249	Bu_3	$Ph_3GeCHArCH_2C$ $Ar=3\text{-}MeC_6H_4$	$C_{46}H_{58}O_2GeSn$	86	126-127
250	Cy_3	$Ph_3GeCHArCH_2C$ Ar=Ph	$C_{39}H_{50}O_2GeSn$	48	90-92
251	Cy_3	$Ph_3GeCHArCH_2C$ $Ar=4\text{-}MeC_6H_4$	$C_{40}H_{52}O_2GeSn$	66	82-85
252	Cy_3	$Ph_3GeCHArCH_2C$ $Ar=4\text{-}ClC_6H_4$	$C_{39}H_{49}O_2ClGeSn$	72	73-76
253	Cy_3	$Ph_3GeCHArCH_2C$ $Ar=3\text{-}PhOC_6H_4\text{-}$	$C_{45}H_{54}O_3GeSn$	80	102-103
254	Cy_3	$Ph_3GeCHArCH_2\text{-}C$ $Ar=4\text{-}MeOC_6H_4$	$C_{40}H_{52}O_3GeSn$	72	76-78
255	Cy_3	$Ph_3GeCHArCH_2\text{-}C$ $Ar=2\text{-}MeOC_6H_4$	$C_{40}H_{52}O_3GeSn$	69	101-103
256	Cy_3	$Ph_3GeCHArCH_2C$ $Ar=2\text{-}ClC_6H_4$	$C_{39}H_{49}O_2ClGeSn$	74	87-90
257	Cy_3	$Ph_3GeCHArCH_2C$ $Ar=4\text{-}FC_6H_4$	$C_{39}H_{49}O_2FGeSn$	78	96-97

Table 1: (continued)

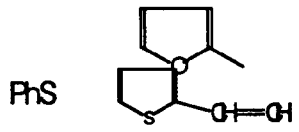
	R_3	R'	M.F.	Yield%	m.p
258	Cy_3	$Ph_3GeCHArCH_2C$ Ar=2-MeC_6H_4	$C_{40}H_{52}O_2GeSn$	66	85-86
259	Cy_3	$Ph_3GeCHArCH_2C$ Ar=3-MeC_6H_4	$C_{40}H_{52}O_2GeSn$	75	90-91
260	Bu_2Cy	n-Pr	$C_{18}H_{36}O_2Sn$	91	59-61
261	Bu_2Cy	Ph	$C_{21}H_{34}O_2Sn$	83	visc.
262	Bu_2Cy	4-ClC_6H_4	$C_{21}H_{33}ClO_2Sn$	85	visc.
263	Bu_2Cy	4-$NO_2C_6H_4$	$C_{21}H_{33}NO_4Sn$	87	visc.
264	$BuCy_2$	n-Pr	$C_{20}H_{38}O_2Sn$	90	61-63
265	$BuCy_2$	Ph	$C_{23}H_{36}O_2Sn$	81	visc.
266	$BuCy_2$	4-ClC_6H_4	$C_{23}H_{35}ClO_2Sn$	83	visc.
267	$BuCy_2$	4-$NO_2C_6H_4$	$C_{23}H_{35}NO_4Sn$	84	visc.
268	$C_6H_5CH_2$	H	$C_{22}H_{22}O_2Sn$	85	140-142
269	$C_6H_5CH_2$	Me	$C_{23}H_{24}O_2Sn$	82	112-113
270	$C_6H_5CH_2$	Et	$C_{24}H_{26}O_2Sn$	78	98-100
271	$C_6H_5CH_2$	n-Pr	$C_{25}H_{28}O_2Sn$	80	62-64
272	$C_6H_5CH_2$	n-Bu	$C_{26}H_{30}O_2Sn$	78	68-69
273	$C_6H_5CH_2$	n-C_5H_{11}	$C_{27}H_{32}O_2Sn$	72	67-69
274	$C_6H_5CH_2$	n-C_7H_{15}	$C_{29}H_{36}O_2Sn$	75	67-68
275	$C_6H_5CH_2$	Ph	$C_{28}H_{26}O_2Sn$	77	102-103
276	$C_6H_5CH_2$	4-MeC_6H_4	$C_{29}H_{28}O_2Sn$	70	96-98
277	$C_6H_5CH_2$	4-$MeOC_6H_4$	$C_{29}H_{28}O_3Sn$	77	102-104
278	$C_6H_5CH_2$	4-FC_6H_4	$C_{28}H_{25}FO_2Sn$	78	99-100
279	$C_6H_5CH_2$	4-ClC_6H_4	$C_{28}H_{25}ClO_2Sn$	74	106-107
280	$C_6H_5CH_2$	4-IC_6H_4	$C_{28}H_{25}IO_2Sn$	76	108-109
281	$C_6H_5CH_2$	4-$NO_2C_6H_4$	$C_{28}H_{25}NO_4Sn$	87	92-94
282	$C_6H_5CH_2$	4-$NH_2C_6H_4$	$C_{28}H_{27}NO_2Sn$	86	liquid
283	$C_6H_5CH_2$	$PhOCH_2$	$C_{29}H_{28}O_3Sn$	71	90-92
284	Me_3	PhS	$C_{10}H_{14}O_2SSn$	85	155-7
285	Et_3	PhS	$C_{13}H_{20}O_2SSn$	78	112-3
286	Bu_3	PhS	$C_{19}H_{33}O_2SSn$	65	59-60
287	Ph_3	PhS	$C_{25}H_{20}O_2SSn$	82	129
288	Cy_3	PhS	$C_{25}H_{38}O_2SSn$	78	78-79
289	Me_3	PhO	$C_{10}H_{14}O_3Sn$	80	160-2
290	Et_3	PhO	$C_{13}H_{20}O_3Sn$	85	100
291	Bu_3	PhO	$C_{19}H_{32}O_3Sn$	86	70
292	Ph_3	PhO	$C_{25}H_{20}O_3Sn$	83	122-5
293	Cy_3	PhO	$C_{25}H_{38}O_3Sn$	87	117-9
294	Me_3	C_9H_9	$C_{13}H_{18}O_3Sn$	92	154
295	Bu_3	C_9H_9	$C_{22}H_{36}O_2Sn$	78	57
296	Ph_3	C_9H_9	$C_{34}H_{24}O_2Sn$	75	128
297	Cy_3	C_9H_9	$C_{28}H_{42}O_2Sn$	80	63-5
298	Me_3	$C_{14}H_{14}N$	$C_{18}H_{23}NO_2Sn$	75	123-5
299	Bu_3	$C_{14}H_{14}N$	$C_{27}H_{41}NO_2Sn$	60	135
300	Ph_3	$C_{14}H_{14}N$	$C_{33}H_{29}NO_2Sn$	68	158-6
301	Cy_3	$C_{14}H_{14}N$	$C_{33}H_{47}NO_2Sn$	70	144
302	Bz_3	$C_{14}H_{14}N$	$C_{36}H_{35}NO_2Sn$	85	65-67
303	Me_3	$C_{13}H_{10}NCl_2$	$C_{17}H_{19}NO_2SnCl_2$	86	125
304	Bu_3	$C_{13}H_{10}NCl_2$	$C_{26}H_{34}NO_2SnCl_2$	92	35
305	Ph_3	$C_{13}H_{10}NCl_2$	$C_{32}H_{25}NO_2SnCl_2$	93	95
306	Bz_3	$C_{13}H_{10}NCl_2$	$C_{35}H_{31}NO_2SnCl_2$	69	110
307	Me_2	PhS	$C_{16}H_{16}O_4S_2Sn$	80	135-6
308	Bu_2	PhS	$C_{22}H_{28}O_4S_2Sn$	79	67-68
309	Ph_2	PhS	$C_{26}H_{20}O_4S_2Sn$	83	101-2
310	Et_2	PhS	$C_{18}H_{20}O_2S_2Sn$	84	99
311	Me_2	PhO	$C_{16}H_{16}O_6Sn$	60	138
312	Bu_2	PhO	$C_{22}H_{28}O_6Sn$	93	55

Table 1: (continued)

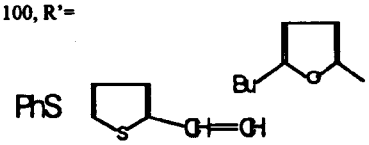
	R_3	R'	M.F.	Yield%	m.p
313	Ph_2	PhO	$C_{26}H_{20}O_6Sn$	80	98
314	Et_2	PhO	$C_{18}H_{20}O_6Sn$	65	81-82
315	Me_2	C_9H_9	$C_{22}H_{24}O_4Sn$	83	165-7
316	Bu_2	C_9H_9	$C_{28}H_{36}O_4Sn$	78	87-88
317	Me_2	$C_{14}H_{14}N$	$C_{32}H_{46}O_4N_2Sn$	84	154-5
318	Bu_2	C14H14N	$C_{38}H_{46}O_4Sn$	80	100

Note. Compound no. (ref.)
1-12(8), 12-21(10), 21-35(18) 36-55(19), 56-81(11),82-101(22),102-119(9),120-142(33),143-156(13).157-176(21),177-191(24),192-208(20),209-225(54),226-246(52),247-266(2),267-274(55), 275-294(61),295-299,318-21(14),300-304,322-25(62),305-8,326-27(60),309-13,328-29(15),314-317(63).

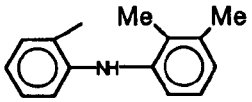
108, R'=



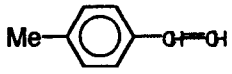
100, R'=



R'=



R'= $C_{14}H_{14}N$



R'=C_9H_9

m.p = melting point, liq.= Liquid and visc = viscous

Table 2: IR and ^1H NMR data for the organtincarboxylates.

	IR(cm^{-1})			NMR(δ, ppm)		
	asym vCO_2	sym vCO_2	ΔvCO_2			
1	1591	1412	179	0.84(t,9H), 1.26(q,6H) 1.20~1.64(m,12H)	3.93(s,2H)	3.36(s,3H)
2	1587	1413	174	0.86(t,9H), 1.08~1.64 (m,18H)	3.95(s,2H)	1.16(t,3H), 3.58(q,2H)
3	1576	1411	165	0.86(t,9H), 1.26(q,6H) 1.28~1.70(m,12H)	3.97(s,2H)	0.88(t,3H),1.50(m,2H) 3.40(t,2H)
4	1580	1400	180	0.79(t,9H), 1.20~1.50 (m,18H) 1.40(m,2H),3.39(t,2H)	3.91(s,2H)	0.79(t,3H),1.20(m,2H)
5	1580	1410	170	0.86(t,9H), 1.14~1.64 (m,18H) 3.44(t,2H)	3.98(s,2H)	0.86(t,3H),1.14~1.64 (m,6H)
6	1578	1400	178	0.85(t,9H), 1.14~1.64 (m,18H) 3.42(t,2H)	3.96(s,2H)	0.85(t,3H),1.13~1.60 (m,8H)
7	1578	1405	173	0.85(t,9H), 1.10~1.62 (m,18H)	4.00(s,2H)	1.15(d,6H), 3.63 (m,1H)
8	1580	1400	180	0.88(t,9H), 1.10~1.68 (m,18H) 3.48(t,2H)	3.99(s,2H)	0.88(t,6H),1.10~1.68 (m,3H)
9	1589	1402	187	0.80~1.38(m,27H)	4.53(s,2H)	6.86~7.63(m,7H)
10	1603	1414	189	0.78~1.43(m,27H)	4.65(s,2H)	6.47~8.33(m,7H)
11	1603	1414	189	0.87(t,9H), 1.10~1.32 (m,18H)	4.40(s,2H)	6.77~7.17(dd,4H) 2.15(s,3H)
12*	1589	1402	187	0.80(t,9H), 1.07~1.40 (m,18H)	3.40(s,2H)	6.55~6.97(dd,4H) 2.17(s,3H)
13	1640	1327	313	7.40~7.86 (m,35H)	0.44(s,6H)	0.60(s,9H),
14	1636	1327	309	7.20~7.36 (m,34H)	0.36(s,6H)	0.52(s,9H),
15	1634	1326	308	6.82~772 (m,34H)	0.40(s,6H)	0.58(s,9H),
16	1642	1320	314	7.34~762 (m,34H)	0.24(s,6H)	0.34(s,9H),
17	1642	1327	315	7.00~768 (m,34H)	0.36(s,6H)	0.50(s,9H),
18	1648	1330	318	7.30~7.40 (m,34H)	0.34(s,6H)	0.48(s,9H),
19	1648	1326	322	7.12~7.92 (m,34H)	0.20(s,6H)	0.30(s,9H),
20	1614	1318	296	6.60~7.34 (m,34H)	0.34(s,6H)	0.52(s,9H),

Table 2: (continued)

	IR(cm^{-1})			NMR(δ, ppm)		
	asym νCO_2	sym νCO_2	$\Delta\nu CO_2$			
21	1618	1337	281	3.86 (s,3H), 6.92~7.30(m, 34H)	0.40(s,6H)	0.58(s,9H)
22	1640	1323	317	0.11(s,27H)	0.37(s,6H)	8.04(d,2H),7.39(m,3H)
23	1634	1322	312	0.11(s,27H)	0.36(s,6H)	7.56(q,4H),2.37(s,3H)
24	1626	1317	309	0.09(s,27H)	0.33(s,6H)	7.42(q,4H),3.79(s,3H)
25	1642	1316	326	0.08(s,27H)	0.32(s,6H)	7.53(q,4H)
26	1641	1318	323	0.09(s,27H)	0.35(s,6H)	7.64(q,4H)
27	1646	1315	331	0.06(s,27H)	0.36(s,6H)	7.08(q,4H)
28	1628	1345	283	0.07(s,27H)	0.34(s,6H)	6.81-7.93(m,5H)
29	1585	1332	253	0.09(s,27H)	0.30(s,6H)	6.85-7.96(m,5H)
30	1619	1328	291	0.07(s,27H)	0.33(s,6H)	6.90-7.90(m,4H) 3.76(s,3H)
31	1638	1307	331	0.09(s,27H)	0.36(s,6H)	6.90-7.65(m,4H) 3.78(s,3H)
32	1641	1315	326	0.08(s,27H)	0.35(s,6H)	7.69(q,4H)
33	1657	1322	335	0.06(s,27H)	0.36(s,6H)	7.45-7.68(m,4H)
34	1652	1321	331	0.05(s,27H)	0.35(s,6H)	7.20-8.25(m,4H)
35	1650	1307	343	0.06(s,27H)	0.34(s,6H)	7.34-7.75(m,3H)
36	1598,1573 (1633)	1360	238,213	0.92(6H,t,*J*=7.08), 1.25-1.91(23H,m), 8.22(1H,s)		
37	1565	1409	156	0.92(6H,t,*J*=7.12), 1.23-1.93(23H,m), 2.05(3H,s)		
38	1581,1557 (1628)	1417	164,140	0.92(6H,t,*J*=7.23), 1.31-1.93(26H,m), 2.32(2H,q,*J*=7.52)		
39	1578-1553 (1621)	1402	176-151	0.91(9H,t,*J*=7.15), 1.18-1.98(27H,m), 2.31(2H,t,*J*=7.38)		
40	1586-1555 (1628)	1414	172-141	0.92(6H,m), 1.14-1.93(29H,m), 2.58(1H,m)		
41	1580-1553 (1625)	1400	180-153	0.88-1.00(12H,m), 1.22-1.91(23H,m), 2.04(1H,m), 2.20(2H,d,*J*=6.25)		
42	1647	1333	314	0.89(6H,t,*J*=7.30), 1.22-1.89(23H,m), 7.06-8.04(4H,m)		
43	1639	1335	304	0.90(6H,t,*J*=7.12), 1.25-1.94(23H,m), 2.38(3H,s), 7.24(2H,d,*J*=7.92), 7.98(2H,d,*J*=7.92)		
44	1620	1312	308	0.92(6H,t,*J*=7.13), 1.28-1.94(23H,m), 3.86(1H,s), 6.90(2H,d,*J*=8.65), 8.02(2H,d,*J*=8.65)		
45	1606(1630)	1330	276	0.90(6H,t,*J*=7.09), 1.26-1.93(23H,m), 2.86(3H,s), 6.90-6.95(2H,m), 7.38(1H,m), 7.79(1H,d)		
46	1616	1350	266	0.88(6H,t,*J*=7.17), 1.27-1.91(23H,m), 8.84(2H,m), 7.90(2H,m)		
47	1598	1343	255	0.89(6H,t,*J*=7.19), 1.23-1.93(23H,m), 4.07(2H,s)		
48	1639	1327	312	0.90(6H,t,*J*=7.12), 1.26-1.98(23H,m), 3.83(3H,s), 7.05-7.63(4H,m)		
49	1655	1352	303	0.89(6H,t,*J*=7.11), 1.25-1.99(23H,m), 7.56(1H,t), 8.31-8.56(2H,m), 8.84(1H,d)		
50	1631(1626)	1393	238	0.92(6H,t,*J*=7.00), 1.27-1.96(23H,m), 2.84-6.96(2H,m), 7.39(1H,m), 7.90(1H,m), 11.57(1H,s)		
51	1630(1632)	1352	278	0.92(6H,t,*J*=7.13), 1.27-1.99(23H,m), 5.74(2H,s), 6.60-6.67(2H,m), 7.20(1H,m), 7.95(1H,m)		
52	1639	1368	271	0.90(6H,t,*J*=7.14), 1.26-1.98(23H,m), 4.03(2H,s), 6.10-6.14(2H,m), 7.65(1H,m), 11.86(1H,s)		
53	1595(1625)	1356	239	0.88(6H,t,*J*=7.04), 1.27-1.90(23H,m), 6.43(1H,s),7.06(1H,s), 7.49(1H,s)		
54	1585(1628)	1369	216	0.89(6H,t,*J*=7.14), 1.21-1.91(32H,m), 6.03(1H,d), 8.94(1H,d)		
55	1640(1635)	1314	326	0.89(6H,t,*J*=7.10), 1.32-1.93(23H,m), 7.24-7.51(5H,m), 8.05(2H,s)		
56	1660	1330	330	- 0.03 [24H,m,3 x $CH_2Si(CH_3)_2$], 4.13 (2H,s,OCH_2), 6.63-7.08(20H,m,C_6H_5O and 3 x C_6H_5Si)		
57	1660	1330	330	- 0.24 [24H,m,3 x $CH_2Si(CH_3)_2$], 3.84 (2H,s,OCH_2), 6.26-6.90(19H,m,4-ClC_6H_4O and 3 x C_6H_5Si)		
58	1660	1330	330	- 0.20 [24H,s,3 x $CH_2Si(CH_3)_2$], 3.77 (2H,s,OCH_2), 6.16-6.71(19H,m,4-BrC_6H_4O and 3 x C_6H_5Si)		
59	1660	1330	330	0.15 (6H,s, 3 x CH_2Si), 0.36 [18H,s, 3 x $Si(CH_3)_2$], 4.37 (2H,s,OCH_2), 6.67-7.38 (19H,m,4-IC_6H_4O and 3 x C_6H_5Si)		
60	1660	1330	330	0.05 (6H,s, 3 x CH_2Si), 0.21 [18H,s, 3 x $Si(CH_3)_2$], 2.19 (3H,Ar-CH_3), 4.19(2H,s, OCH_2), 6.78-7.21(19H,m,4-$CH_3C_6H_4O$ and 3 x C_6H_5Si)		
61	1671	1345	326	- 0.01 [24H,s,3 x $CH_2Si(CH_3)_2$], 4.16 (2H,s,OCH_2), 7.10(15H,s, 3 x C_6H_5Si), 6.62 and 7.92 (each 2H, 4-$NO_2C_6H_4O$)		
62	1660	1330	330	- 0.09 (6H,s, 3 x CH_2), 0.04 [18H,s, 3 x $Si(CH_3)_2$], 2.21 (3H,Ar-CH_3), 4.26(2H,s, OCH_2), 6.78-7.44(19H,m,3-$CH_3C_6H_4O$ and 3 x C_6H_5Si)		
63	1660	1330	330	- 0.09 (6H,s, 3 x CH_2Si), 0.03 [18H,s, 3 x $Si(CH_3)_2$], 4.23 (2H,s,OCH_2), 6.75-7.15 (19H,m,2-ClC_6H_4O and 3 x C_6H_5Si)		
64	1660	1330	330	0.30 (6H,s, 3 x CH_2Si), 0.52 [18H,s, 3 x $Si(CH_3)_2$], 4.53 (2H,s,OCH_2), 7.43 (19H,m,3-$NO_2C_6H_4O$ and 3 x C_6H_5Si)		

Table 2: (continued)

	IR(cm^{-1})			NMR(δ, ppm)
	asym νCO_2	sym νCO_2	$\Delta\nu CO_2$	
65	1665	1342	323	- 0.03 (6H,s, 3 x CH_2Si), 0.12 [18H,s, 3 x $Si(CH_3)_2$], 2.14 (3H,s,Ar-CH_3), 4.26 (2H,s, OCH_2), 6.42-7.17(19H,m,2-$CH_3C_6H_4O$ and 3 x C_6H_5Si)
66	1666	1345	321	- 0.05 (6H,s, 3 x CH_2Si), 0.05 [18H,s, 3 x $Si(CH_3)_2$], 4.16 (2H,s, OCH_2), 6.34 (1H,d) and 6.82(1H,dd) and 7.08 (19H,s,2,4-$Cl_2C_6H_4O$ and 3 x C_6H_5Si)
67	1666	1336	330	- 0.08 [24H,s,3 x $CH_2Si(CH_3)_2$], 4.24 (2H,s,OCH_2), 7.10-7.16 (17H,m, 2,4,6-$Cl_3C_6H_4O$ and 3 x C_6H_5Si)
68	1663	1339	324	- 0.08 (6H,s, 3 x CH_2Si), 0.08 [18H,s, 3 x $Si(CH_3)_2$], 3.10 (2H,d,CH_2=CH-CH_2-), 3.61 (3H,s,CH_3O), 4.28 (2H,s,OCH_2), 4.76 and 4.90 (each 1H,d,CH_2=CH), 5.5-6.0 (1H,m,CH_2=CH), 6.46 (3H,s,2-MeO-4-CH_2=$CHCH_2C_6H_3$), 7.10 (15H,s, 3 x C_6H_5Si)
69	1720	1340	380	- 0.20 (6H,s, 3 x CH_2Si), 0.25 [18H,s, 3 x $Si(CH_3)_2$], 3.32 (3H,s,CH_3O), 3.80 (2H,s, CH_3O), 7.27 (15H,s, 3 x C_6H_5Si)
70	1680	1320	360	- 0.19 (6H,s, 3 x CH_2Si), 0.24 [18H,s, 3 x $Si(CH_3)_2$], 1.18 (3H,t,CH_3CH_2O), 3.46(2H, q, CH_3CH_2O), 3.75 (2H,s, OCH_2), 7.28 (15H,s, 3 x C_6H_5Si)
71	1660	1320	340	- 0.28 [24H,s,3 x $CH_2Si(CH_3)_2$], 0.92 (3H,t,CH_3CH_2), 1.64 (2H,m,CH_3CH_2), 3.42 (2H,t,EtCH_2O), 3.92 (2H,s,OCH_2), 7.31 (15H,s, 3 x C_6H_5Si)
72	1650	1340	310	- 0.28 [24H,s,3 x $CH_2Si(CH_3)_2$], 0.92 (3H,t,CH_3CH_2), 1.48 (4H,m,CH_3 CH_2 CH_2), 3.48 (2H,t,Et CH_2CH_2O), 3.90 (2H,s, OCH_2), 7.34 (15H,s, 3 x C_6H_5Si)
73	1680	1320	360	- 0.21 (6H,s, 3 x CH_2Si), 0.27 [18H,s, 3 x $Si(CH_3)_2$], 0.93-1.79 (9H,m,C_4H_9), 3.46 (2H,t,$C_4H_9CH_2O$), 3.81 (2H,s, OCH_2), 7.28 (15H,s, 3 x C_6H_5Si)
74	1640	1320	320	- 0.03 (6H,s, 3 x CH_2Si), 0.18 [18H,s, 3 x $Si(CH_3)_2$], 3.70 (3H,s,$ArOCH_3$), 7.14 (15H,s, 3 x C_6H_5Si), 6.62 and 7.80 (each 2H,d, 4-$MeOC_6H_4$)
75	1645	1320	325	- 0.07 (6H,s, 3 x CH_2Si), 0.13 [18H,s,Si $(CH_3)_2$], 7.14 (20H,s,$C_6H_5CO_2$ and 3 x C_6H_5Si)
76	1645	1320	325	- 0.28 [24H,s,3 x $CH_2Si(CH_3)_2$], 7.30 (15H,s, 3 x C_6H_5Si), 7.00-8.00 (4H,m, 4-FC_6H_4)
77	1645	1320	325	- 0.10 (6H,s, 3 x CH_2Si), 0.16 [18H,s, 3 x $Si(CH_3)_2$], 7.21 (15H,s, 3 x C_6H_5Si), 7.18 and 7.86 (each 2H,d, 4-ClC_6H_4)
78	1645	1320	325	- 0.30 [24H,s,3 x $CH_2Si(CH_3)_2$], 7.32 (15H,s, 3 x C_6H_5Si), 7.19-8.00 (4H,m, 4-BrC_6H_4)
79	1650	1320	330	- 0.15 [24H,s,3 x $CH_2Si(CH_3)_2$], 7.77 (15H,s, 3 x C_6H_5Si), 7.78 and 8.18 (each 2H,d, 4-$NO_2C_6H_4$)
80	1640	1320	320	- 0.11 (6H,s, 3 x CH_2Si), 0.20 [18H,s, 3 x $Si(CH_3)_2$], 3.72 (3H,s, CH_3OAr), 7.10 (15H,s, 3 x C_6H_5Si), 6.65-7.27 (4H,m, 2-$MeOC_6H_4$)
81				- 0.00 (6H,s, 3 x CH_2Si), 0.12 [18H,s, 3 x $Si(CH_3)_2$], 7.12 (15H,s, 3 x C_6H_5Si), 6.30-7.30 (3H,m, OCH=CHCH=C-)
82	1565-1595 (1632)	1360	205-235	0.41(3H,t,$2J_{Sn-H}$=44.49, ,CH_3Sn), 1.37~1.94, (22H,m,2xC_6H_{11}), 8.25(1H,s,HCO_2).
83	1553 (1640)	1398	155	0.31(3H,t,$2J_{Sn-H}$=45.06, ,CH_3Sn), 1.34~1.87, (22H,m,2xC_6H_{11}), 2.03(3H,s,CH_3-CO_2).
84	1515-1565 (1625)	1360	155-205	0.32(3H,t,$2J_{Sn-H}$=44.44,CH_3Sn), 1.12(3H,t,J=7.57,CH_3), 1.35~1.86(22H,m,2xC_6H_{11}), 2.31(2H,q, J=7.57, CH_2CO_2).
85	1545 (1627)	1395	150	0.34(3H,t,$2J_{Sn-H}$=44.56,CH_3Sn), 0.93(3H,t,J=7.36,CH_3), 1.35~1.92(24H,m,2xC_6H_{11}andCH_2), 2.28(2H,t, J=7.35, CH_2CO_2).
86	1543 (1622)	1390	153	0.33(3H,t, $2J_{Sn-H}$=44.56 ,CH_3Sn), 0.91(3H, t, J=7.19, CH_3), 1.33-1.92(26H, m, 2C_6H_5 and $(CH_2)_2$), 231(2H, J=7.43, CH_2CO_2)
87	1547	1392	155	0.33(3H,t,$2J_{Sn-H}$=45.08,CH_3Sn), 0.86(3H,t,J=7.19, CH_3), 1.33~1.92(26H,m,2xC_6H_{11},$(CH_2)_2$), 2.31(2H,t, J=7.43, CH_2CO_2).
88	1547-1570 (1628)	1356	191,214	0.40(3H,t,$2J_{Sn-H}$=45.09,CH_3Sn), 1.16(6H,d,J=6.94,2xCH_3), 1.36~2.06(22H,m,2xC_6H_{11},), 2.55(1H,m, CH-CO_2).
89	1547-1573	1390	157,183	0.33(3H,t,$2J_{Sn-H}$=44.22,CH_3Sn), 0.95(6H,d,J=6.40,2xCH_3), 1.36~1.92(22H,m,2xC_6H_{11},), 2.05(1H,m, CH), 2.19(2H, d, J=6.17, CH_2CO_2).
90	1634 (1634)	1323	311	0.43(3H,t,$2J_{Sn-H}$=44.37,CH_3Sn),1.37~1.98(22H,m,2xC_6H_{11}) 7.39~7.49(3H,m,C_6H_5),8.02(2H,d,C_6H_5)
91	1644	1331	313	0.42(3H,t,$2J_{Sn-H}$=44.37 ,CH_3Sn), 1.36~1.96(22H,m,2xC_6H_{11},), 7.35~7.97(4H,dd,J=8.30, C_6H_4),
92	1628 (1635)	1311	317	0.46(3H,t,$2J_{Sn-H}$=44.13,CH_3Sn), 1.20~1.99(22H,m,2xC_6H_{11},), 8.20(4H,q,C_6H_4)
93	1640	1337	303	0.40(3H,t,$2J_{Sn-H}$=44.84,CH_3Sn), 1.36~1.98(22H,m,2xC_6H_{11},), 3.82(3H,s,CH_3O), 6.87~8.00(4H,dd,C_6H_4)

Table 2: (continued)

	IR(cm^{-1})			NMR(δ, ppm)
	asym νCO_2	sym νCO_2	$\Delta\nu CO_2$	
94	1606	1389	217	0.42(3H,t,$2J_{Sn-H}$=44.37,CH_3Sn), 1.34~2.01(22H,m,2xC_6H_{11},), 6.81~7.92 (4H,dd,C_6H_4),
95	1638	1335	303	0.42(3H,t,$2J_{Sn-H}$=44.37,CH_3Sn), 1.26~2.01(22H,m,2xC_6H_{11},), 2.38(3H,s,CH_3-Ph), 7.21~7.93 (4H,dd,J=7.89,C_6H_4)
96	1630	1352	278	0.38(3H,t,$2J_{Sn-H}$=44.37,CH_3Sn), 1.35~1.96(22H,m,2xC_6H_{11},), 4.05(2H,s,NH_2), 6.60~7.85 (4H,dd,J=8.34,C_6H_4)
97	1645	1335	310	0.42(3H,t,$2J_{Sn-H}$=44.37,CH_3Sn), 1.36~2.00(22H,m,2xC_6H_{11},), 7.04~8.04 (4H,dt,C_6H_4)
98	1606 (1632)	1391	215	0.35(3H,t,$2J_{Sn-H}$=44.67,CH_3Sn), 1.37~1.97(22H,m,2xC_6H_{11},), 7.24~7.77 (3H,m,C_6H_3)
99	1592 (1658)	1398	194	0.46(3H,t,$2J_{Sn-H}$=45.64,CH_3Sn), 1.32~1.88(22H,m,2xC_6H_{11}), 4.63(2H,s,-o-CH_2-CO_2), 6.70-7.10 7.34(3H,m,C_6H_3)
100	1652	1367	285	0.21(6H,s,3SiCH_2), 0.46(9H,s,3Si, CH_3), 1.82(3H,s,CH_3), 7.32(30H,s,3Si (C_6H_5).
101	1648	1370	278	0.22(6H,s,3SiCH_2), 0.45(9H,s,3Si, CH_3), 1.26(3H,t,CH_2CH_3), 2.12(2H,q, CH_2CH_3), 7.30(30H,s,3Si ($C_6H_5)_2$) .
102	1646	1374	272	0.21(6H,s,3SiCH_2), 0.45(9H,s,3Si, CH_3), 0.90(3H,t, $CH_2CH_2CH_3$), 1.50(2H,m,$CH_2CH_2CH_3$), 2.04(2H,q, $CH_2CH_2CH_3$), 7.31(30H,s,3Si ($C_6H_5)_2$) .
103	1645	1375	270	0.24(6H,s,3SiCH_2), 0.50(9H,s,3Si,CH_3), 0.94(3H,t,$CH_2CH_2CH_2CH_3$), 1.34(2H,m,$CH_2CH_2CH_2CH_3$), 1.43(2H,m,$CH_2CH_2CH_2CH_3$), 2.13(2H,q, $CH_2CH_2CH_2CH_3$), 7.36(30H,s,3Si ($C_6H_5)_2$) .
104	1646	1376	270	0.21(6H,s,3SiCH_2), 0.45(9H,s,3Si, CH_3), 0.92(3H,t,$(CH_2)_4$ CH_3), 1.28(4H,m,CH_2CH_2 $(CH_2)_2$ CH_3), 1.50(2H,m,CH_2CH_2 $(CH_2)_2$ CH_3), 2.10(2H,q,$CH_2(CH_2)_2$ CH_3), 7.31(30H,s,3Si($C_6H_5)_2$) .
105	1644	1374	270	0.20(6H,s,3SiCH_2), 0.46(9H,s,3Si, CH_3), 0.88(3H,t, $CH_2CH_2(CH_2)_3$ CH_3), 1.29(6H,m,CH_2CH_2 $(CH_2)_3CH_3$),1.48(2H,m,$CH_2CH_2(CH_2)_3CH_3$), 2.01(2H,q,$(CH_2)_4CH_3$), 7.31(30H,s,3Si($C_6H_5)_2$) .
106	1647	1373	274	0.23(6H,s,3SiCH_2), 0.50(9H,s,3Si, CH_3), 0.90(3H,t, $CH_2CH_2(CH_2)_5$ CH_3), 1.30(10H,m,CH_2CH_2 $(CH_2)_5CH_3$),1.56(2H,m,$CH_2CH_2(CH_2)_5$), 2.11(2H,q,$CH_2(CH_3)_6CH_3$), 7.33(30H,s,3Si($C_6H_5)_2$) .
107	1648	1370	278	0.22(6H,s,3SiCH_3), 0.48(9H,s,3Si, CH_3), 0.90(3H,t,$CH_2CH_2(CH_2)_7$ CH_3),1.28(14H,m,CH_2CH_2 $(CH_2)_7CH_3$),1.54(2H,m,$CH_2CH_2(CH_2)_7CH_3$),2.14(2H,q,$CH_2(CH_3)_8CH_3$),,7.32(30H,s,3Si(C_6H_5)$_2$)
108	1661	1424	237	0.29(6H,s,3SiCH_2), 0.40(9H,s,3Si, CH_3), 6.81(1H,d, $\overline{OCH=CHCH=C}$), 7.28(1H,d, $\overline{OCH=CHCH=C}$), 7.30(30H,s,3Si($C_6H_5)_2$), 7.35(1H,m, $\overline{OCH=CHCH=C}$)
109	1683	1382	301	0.29(6H,s,3CH_2Si), 0.48(9H,s,3Si, CH_3), 4.28(2H,s, CH_2O), 6.94(5H,m,O-C_6H_5), 7.36(30H,s,3Si($C_6H_5)_2$) .
110	1677	1381	296	0.30(6H,s,3SiCH_2), 0.50(9H,s,3Si, CH_3), 2.31(3H,s, OC_6H_4 CH_3), 4.28(2H,s,CH_2 O), 6.80(2H,d,C_6H_5O-), 7.12(2H,d, C_6H_5O-), 7.36(30H,s,3Si($C_6H_5)_2$) .
111	1678	1380	298	0.28(6H,s,3SiCH_2), 0.49(9H,s,3CH_3 Si), 4.24(2H,s,CH_2 O), 6.80(2H,d,C_6H_4OCl), 7.35(30H,s,3Si($C_6H_5)_2$) .
112	1686	1396	290	0.24(6H,s,3SiCH_2), 0.49(9H,s,3Si CH_3), 4.36(2H,s,OCH_2), 7.32(34H,s,3Si($C_6H_5)_2$) OC_6H_4Cl .
113	1688	1382	306	0.29(6H,s,3CH_2Si), 0.48(9H,s,3Si CH_3), 4.32(2H,s,O-CH_2), 6.86(2H,d,C_6H_4OBr), 7.22(2H,d, C_6H_4BrO) 7.36(30H,s,3Si($C_6H_5)_2$) .
114	1690	1378	312	0.30(6H,s,3Si CH_2), 0.50(9H,s,3Si CH_3), 4.32(2H,s,O-CH_2), 6.80(2H,d,C_6H_4IO), 7.24(2H,d, C_6H_4IO) 7.36(30H,s,3Si($C_6H_5)_2$) .
115	1652	1319	333	0.20(6H,s,3Si CH_2), 0.50(9H,s,3Si CH_3), 4.10(2H,s,CH_2O), 7.32(30H,s,3Si($C_6H_5)_2$) 7.86 (4H,m, $C_6H_4NO_3$) .
116	1683	1382	301	0.29(6H,s,3SiCH_3), 0.49(9H,s,3SiCH_3), 4.29(2H,s,CH_2O), 7.33((33H,s,3Si($C_6H_5)_2$ and $OC_6H_3Cl_2$))
117	1661	1329	332	0.25(6H,s,3Si-CH_2), 0.49(9H,s,3Si CH_3), 4.32(2H, s, CH_2O), 7.32(2H,s,3Si($C_6H_5)_2$) 7.70(2H,s, $OC_6H_2Cl_3$) .
118	1636	1404	132	1.30-1.98(m), 2.32(t), 0.97(t)
119	1640	1400	140	1.31-1.99(m), 2.31(t), 0.97(t)
120	1665	1385	180	1.30-1.98(m), 2.31(t), 0.89(t)
121	1603	1367	236	1.30-1.98(m), 2.13(d), 0.98(d)
122	1647	1368	274	
123	1631	1334	297	1.32-1.91(m),-, 2.40(s), 7.58,7.66(d) .

Table 2: (continued)

	IR(cm^{-1})			NMR(δ, ppm)
	asym νCO_2	sym νCO_2	$\Delta\nu CO_2$	
124	1646	1355	291	
123	1647	1324	323	
124	1622	1328	294	1.37-1.96(m),-,-, 7.36,8.32(d) .
125	1620	1357	263	
126	1649	1325	324	1.34-1.93(m),-, 7.04-7.96(m) .
129	1641	1338	303	
130	1644	1376	268	1.34-1.96(m),-,-, 7.30-7.94(m) .
131	1669	1392	277	1.32-1.92(m),-,-, 7.30-8.10(m).
132	1650	1349	301	
133	1660	1339	321	1.32-1.91(m),-,-, 7.24-8.25(m).
134	1605	1362	243	1.34-1.94(m),-,-, 7.04-8.04(m).
135	1644	1317	327	1.35-1.92(m),-,-, 7.12-8.48(m).
136				
137	1600	1300	300	1.20~1.92(m,33H,Cy), 4.56(2H,s, OCH_2), 6.76~7.27(5H, m, C_6H_5).
138	1685	1395	290	1.12~1.84(33H,m,Cy), 4.59(2H,s, OCH_2), 6.64~7.28(4H, m, C_6H_4Cl)
139	1590	1300	290	1.20~1.88(33H,m,Cy), 4.49(2H,s, OCH_2), 6.64~7.18(m,4H,C_6H_4Cl)
140	1675	1360	315	1.12~1.92(m,33H,Cy), 4.47(s,2H, OCH_2), 6.64~7.16(4H,m,C_6H_4Cl)
141	1680	1400	280	1.24~1.92(33H,m,Cy), 4.71(2H,s, OCH_2), 6.60~7.30(3H,m,$C_6H_5Cl_2$)
142*	1635	1300	335	1.12~1.86(m,33H,Cy), 4.52(s,2H, OCH_2), 7.20(s,2H,OCH_2), 7.20(s,2H,$C_6H_3Cl_2O$)
143	1680	1360	320	1.20~1.88(33H,m,Cy), 4.50(2H,s, OCH_2), 6.64~7.32(4H,m,C_6H_5Br)
144	1677	1363	314	1.20~1.86(33H,m,Cy), 4.48(2H,s, OCH_2), 6.48~7.48(4H,m,C_6H_5I)
145	1603	1330	273	1.12~1.88(33H,m,Cy), 4.54(2H,s, OCH_2), 6.92~7.14(4H,m,$C_6H_5CH_3$), 2.22(3H,s-CH_3)
146	1600	1335	265	1.12~1.88(33H,m,Cy), 4.50(2H,s,-OCH_2), 6.56~7.16(4H,m,$C_6H_5CH_3$), 2.22(3H,s-CH_3)
147	1613	1340	273	1.16~1.94(33H,m,Cy), 4.50(2H,s, OCH_2), 6.64~7.10(4H,m,$C_6H_5CH_3$), 2.21(3H,s-CH_3)
148	1670	1400	270	1.12~1.88(33H,m,Cy), 4.52(2H,s, OCH_2), 7.12-7.78(4H,m,$C_6H_5CH_3$)
149	1620	1340	280	1.12~1.94(33H,m,Cy), 4.63(2H,s, OCH_2), 6.82-8.16(4H,q,$C_6H_5NO_2$)
150	1680	1380	300	1.10~1.92(33H,m,Cy), 4.58(2H,s, OCH_2), 6.59(3H,s,$C_6H_5OCH_3$), 3.77(3H,S,OCH_3)
151	1579 (1660)	1392	187	0.38 (3H,t, J_{Sn-H}=43.88,CH_3-Sn), 1.34-1.92 (22H, m, $2C_6H_{11}$), 4.60(2H, s, OCH_2), 6.87-7.29 (5H, m, Ar-H).
152	1575	1388	187	0.38 (3H,t, J_{Sn-H}=45.09,CH_3-Sn), 1.34-1.91 (22H, m, $2C_6H_{11}$), 2.26 (3H, s, 4-CH_3),4.58(2H, s, OCH_2), 6.81-7.03 (4H, dd, Ar-H).
153	1570 (1658)	1398	172	0.39 (3H,t, J_{Sn-H}=44.54,CH_3-Sn), 1.34-1.91 (22H, m, $2C_6H_{11}$), 2.28 (3H, s, 2-CH_3),4.63(2H, s, OCH_2), 6.67-7.14 (4H, dd, Ar-H).
154	1570 (1664)	1394	176	0.38 (3H,t, J_{Sn-H}=44.39,CH_3-Sn), 1.34-1.90 (22H, m, $2C_6H_{11}$), 2.28 (3H, s, 3-CH_3),4.56(2H, s, OCH_2), 6.70-7.12 (4H, m, Ar-H).
155	1570	1394	176	0.36 (3H,t, J_{Sn-H}=44.39,CH_3-Sn), 1.33-1.90 (22H, m, $2C_6H_{11}$), 2.24 (6H, s, $2CH_3$),4.55(2H, s, OCH_2), 6.50-6.57 (3H, m, Ar-H).
156*	1594	1391	203	0.39 (3H,t, J_{Sn-H}=44.39,CH_3-Sn), 1.33-1.91 (22H, m, $2C_6H_{11}$), 2.16 (3H, s,CH_3), 2.19(3H, s,CH_3),4.57(2H, s, OCH_2), 6.56-6.93(3H, m, Ar-H).
157	1573	1391	182	0.37 (3H,t, J_{Sn-H}=44.39,CH_3-Sn), 1.33-1.91 (22H, m, $2C_6H_{11}$), 2.16 (3H, s,CH_3), 2.19(3H, s,CH_3),4.55(2H, s, OCH_2), 6.69-6.96(3H, m, Ar-H).
158	1570	1398	172	0.38 (3H,t, J_{Sn-H}=44.89,CH_3-Sn), 1.33-1.92(22H, m, $2C_6H_{11}$), 2.20 (3H, s,CH_3), 2.24(3H, s,CH_3),4.58(2H, s, OCH_2), 6.58-6.97(3H, m, Ar-H).
159	1576	1404	172	0.39 (3H,t, J_{Sn-H}=45.09,CH_3-Sn), 1.36-1.96 (22H, m, $2C_6H_{11}$), 2.28 (6H, s, $2CH_3$),4.36(2H, s, OCH_2), 6.36 (3H, m, Ar-H).
160	1556(16(	1386	170	0.36(3H,t, J_{Sn-H}=44.39,CH_3-Sn), 1.33-1.90 (22H, m, $2C_6H_{11}$), 3.72 (3H, s, OCH_3),4.52(2H, s, OCH_2), 6.81 (4H, dd, Ar-H).
161	1617	1405	212	0.34(3H,t, J_{Sn-H}=43.98,CH_3-Sn), 1.31-1.89 (22H, m, $2C_6H_{11}$), 3.83 (3H, s, OCH_3),4.63(2H, s, OCH_2), 6.75-6.86 (4H, m, Ar-H).
162	1625	1407	218	0.35(3H,t, J_{Sn-H}=42.88,CH_3-Sn), 1.23-1.88 (22H, m, $2C_6H_{11}$), 3.29(2H, d, CH_2),3.83 (3H, s, OCH_3),4.62(2H, s, OCH_2), 5.04(2H, m, CH_2=),5.80(1H, m, CH=), 6.67 (3H, m, Ar-H).
163	1579 (1668)	1389	190	0.37(3H,t, J_{Sn-H}=44.39,CH_3-Sn), 1.34-1.90 (22H, m, $2C_6H_{11}$),4.55(2H, s, OCH_2), 6.78-7.24 (4H, m, Ar-H).
164	1578	1400	178	0.37(3H,t, J_{Sn-H}=44.68,CH_3-Sn), 1.38-1.88 (22H, m, $2C_6H_{11}$),4.67(2H, s, OCH_2), 6.67-7.36 (4H, m, Ar-H).
165	1571	1393	178	0.35(3H,t, J_{Sn-H}=44.60,CH_3-Sn), 1.32-1.88 (22H, m, $2C_6H_{11}$),4.67(2H, s, OCH_2), 6.67-7.36 (4H, m, Ar-H).

Table 2: (continued)

	IR(cm^{-1})			NMR(δ, ppm)
	asym νCO_2	sym νCO_2	$\Delta\nu CO_2$	
166	1593	1403	190	0.39(3H,t, J_{Sn-H}=45.48,CH_3-Sn), 1.33-1.90 (22H, m, $2C_6H_{11}$),4.65(2H, s, OCH_2), 6.84,7.44 (2H, dd, Ar-H).
167	1577	1390	187	0.37(3H,t, J_{Sn-H}=44.54,CH_3-Sn), 1.33-1.89 (22H, m, $2C_6H_{11}$), 6.78-7.31 (4H, m, Ar-H).
168	1574	1393	181	0.38(3H,t, J_{Sn-H}=44.54,CH_3-Sn), 1.33-1.89 (22H, m, $2C_6H_{11}$), 6.73-7.54 (4H, m, Ar-H).
169	1577	1403	174	0.37(3H,t, J_{Sn-H}=43.88,CH_3-Sn), 1.33-1.89 (22H, m, $2C_6H_{11}$), 6.68-7.54 (4H, dd, Ar-H).
170	1590	1397	193	0.39(3H,t, J_{Sn-H}=45.09,CH_3-Sn), 1.33-1.92 (22H, m, $2C_6H_{11}$),4.67(2H, s, OCH_2), 7.24-7.68 (4H, m, Ar-H).
171	1637	1355	282	1.10-2.24(35H, m, $3C_6H_{11}$,$GeCH_2$), 2.34-3.00(8H, m, $N(CH_2)_3$, CH_2CO), 3.76(6H, t, $3CH_2O$)
172	1616	1388	228	1.25(2H, t, $GeCH_2$), 2.40-2.84(8H, m, $N(CH_2)_3$, CH_2CO), 3.62 (6H, t, $3CH_2O$), 7.08-7.80(15H, m, $3C_6H_5$)
173	1539	1386	153	0.64-1.83(29H, m, $3C_4H_9$,$GeCH_2$), 2.26-2.96(8H, m, $N(CH_2)_3$, CH_2CO), 3.74(6H, t, $3CH_2O$)
174	1541	1383	158	0.66-1.72(27H, m, $3C_4H_9$), 2.76-3.04(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.72(6H, t, $3CH_2O$), 7.00-7.46(5H, m, C_6H_5)
175	1633	1333	300	0.64-1.76(29H, m, $2C_4H_9$, C_6H_{11}), 2.72-3.00(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.68(6H, t, $3CH_2O$), 6.92-7.40(5H, m, C_6H_5)
176*	1637	1333	304	0.66-2.00(31H, m, $2C_6H_{11}$,C_4H_9), 2.80-3.08(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.75(6H, t, $3CH_2O$), 7.00-7.44(5H, m, C_6H_5)
177	1633	1329	304	0.92-1.96(33H, m, $3C_6H_{11}$), 2.76-3.08(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.73(6H, t, $3CH_2O$), 7.00-7.44(5H, m, C_6H_5)
178	1539	1390	149	0.64-1.68(27H, m, $3C_4H_9$), 2.30(3H, s, CH_3), 2.80-3.04(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.76(6H, t, $3CH_2O$), 6.84-7.32(4H, q, C_6H_4)
179	1628	1322	306	0.60-1.84(29H, m, $2C_4H_9$, C_6H_{11}), 2.20(3H, s, CH_3), 2.70-2.96(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.67(6H, t, $3CH_2O$), 6.80-7.30(4H, q, C_6H_4)
180	1628	1322	306	0.68-1.96(31H, m, 2 C_6H_{11},C_4H_9), 2.22(3H, s, CH_3), 2.72-3.00(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.68(6H, t, $3CH_2O$), 6.80-7.26(4H, q, C_6H_4)
181	1628	1321	307	0.90-1.92(33H, m, $3C_6H_{11}$), 2.18(3H, s, CH_3), 2.68-2.96(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.64(6H, t, $3CH_2O$), 6.76-7.22(4H, q, C_6H_4)
182	1552	1377	175	0.66-1.68(27H, m, $3C_4H_9$), 2.72-2.96(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.66(6H, t, $3CH_2O$), 6.92-7.30(4H, m, C_6H_4)
183	1628	1327	301	0.64-1.82(29H, m, 2 C_4H_9,C_6H_{11}), 2.72-2.96(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.67(6H, t, $3CH_2O$), 6.96-7.32(4H, m, C_6H_4)
184	1630	1324	306	0.64-1.96 (31H, m, 2 C_6H_{11},C_4H_9), 2.72-2.96(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.66(6H, t, $3CH_2O$), 6.96-7.32(4H, m, C_6H_4)
185	1631	1326	305	0.96-1.96 (33H, m, $3C_6H_{11}$), 2.70-2.96(9H, m, $N(CH_2)_3$, $GeCHCH_2$), 3.64(6H, t, $3CH_2O$), 6.92-7.28(4H, m, C_6H_4)
186	1556	1380	176	035(3H, s, CH_3-Sn) 1.33-1.89(22H,$2C_6H_{11}$) 3.99(2H, s, CH_2O), 3.40(3H, s, CH_3)
187	1566	1392	174	0.35(3H, s, CH_3-Sn) 1.32-1.89(22H,$2C_6H_{11}$) 4.03(2H, s, CH_2O), 3.54(2H, q, OCH_2), 1.22(3H, t, CH_3)
188				0.35(3H, s, CH_3-Sn) 1.33-1.89(22H,$2C_6H_{11}$) 4.03(2H, s, CH_2O), 3.45(2H, t, OCH_2), 0.90(3H, t, CH_3)
189				0.35(3H, s, CH_3-Sn) 1.33-1.89(22H,$2C_6H_{11}$) 4.02(2H, s, CH_2O), 3.64(1H, m, OCH), 1.16(6H, d, $2CH_3$, J=6.1)
190	1559	1401	158	0.34(3H, s, CH_3-Sn) 1.29-1.89(22H,$2C_6H_{11}$) 4.01(2H, s, CH_2O), 3.48(2H, t, OCH_2), 0.88(3H, t, CH_3)
191	1558	1392	166	0.35(3H, s, CH_3-Sn) 1.33-1.89(22H,$2C_6H_{11}$) 4.02(2H, s, CH_2O), 3.47(2H, t, OCH_2, 0.86(3H, t, CH_3)
192	1573	1396	177	0.34(3H, s, CH_3-Sn) 1.26.-1.90(22H,$2C_6H_{11}$) 4.02(2H, s, CH_2O), 3.47(2H, t, OCH_2), 0.85(3H, t, CH_3)
193	1580	1369	211	0.34(3H, s, CH_3-Sn) 1.24-1.90(22H,$2C_6H_{11}$) 4.02(2H, s, CH_2O), 3.47(2H, t, OCH_2), 0.85(5H,m, CH_2CH_3)
194	1583	1381	202	0.38(3H, s, CH_3-Sn) 1.32-1.92(22H,$2C_6H_{11}$) 4.73(2H, s, CH_2O), 7.05-7.75(7H, m, $C_{10}H_7$
195	1596	1381	215	0.34(3H, s, CH_3-Sn) 1.31-1.83(22H,$2C_6H_{11}$) 4.69(1H, q, CHO), 1.66(3H, d, CH_3), 6.72-7.34(3H, m, ArH)
196	1595	1379	216	0.33(3H, s, CH_3-Sn) 1.30-1.83(22H,$2C_6H_{11}$) 4.67(1H, q, CHO), 1.62(3H, d, CH_3), 6.67-7.27(3H, m, ArH)

Table 2: (continued)

	IR(cm^{-1})			NMR(δ, ppm)	
	asym νCO_2	sym νCO_2	$\Delta\nu CO_2$		
197	1558	1395	163	0.29(3H, s, CH_3-Sn) 1.23-1.88(22H,2C_6H_{11})	
198	1558	1380	178	0.32(3H, s, CH_3-Sn) 1.33-1.86(22H,2C_6H_{11})	3.61(2H, s, CH_2), 7.21(5H, t, ArH)
199	1560	1381	179	0.31(3H, s, CH_3-Sn) 1.33-1.88(22H,2C_6H_{11}) 6.11(1H, br, NH)	1.99(3H, s, CH_3), 3.96(2H, d, OCH_2),
200	1505	1362	143		
201	1504	1362	142		
202	1557	1395	162	0.46(3H, s, CH_3-Sn) 1.37-2.02(22H,2C_6H_{11})	6.36(2H, s, CH=CH), 11.83(1H(s, HO_2C)
203	1636	1323	313	1.25-1.82(22H,2C_6H_{11}), 0.39(2H,s,$SiCH_3$), 7.39-8.20(5H,m,ArH)	0.33(2H,s,$SiCH_2$),7.32-7.57(5H, m, SiPh) ,
204	1606	1326	280	1.25-1.81(22H,2C_6H_{11}), 0.38(2H,s,$SiCH_3$), 7.19-7.90(4H,dd,ArH),2.38(3H,s,CH_3)	0.36(2H,s,$SiCH_2$),7.32-7.55(5H, m, SiPh) ,
205	1634	1307	327	1.24-1.81(22H,2C_6H_{11}), 0.37(2H,s,$SiCH_3$), 7.36-7.91(4H,dd,ArH)	0.37(2H,s,$SiCH_2$),7.32-7.54(5H, m, SiPh) ,
206	1631	1317	314	1.25-1.81(22H,2C_6H_{11}), 0.38(2H,s,$SiCH_3$), 7.09-7.99(4H,dd,ArH)	0.38(2H,s,$SiCH_2$),7.32-7.55(5H, m, SiPh) ,
207	1641	1310	331	1.25-1.81(22H,2C_6H_{11}), 0.36(2H,s,$SiCH_3$), 8.15(4H,q,ArH)	0.36(2H,s,$SiCH_2$),7.31-7.51(5H, m, SiPh) ,
208	1619	1305	314	1.24-1.81(22H,2C_6H_{11}), 0.37(2H,s,$SiCH_3$), 6.87-7.96(4H,dd,ArH),3.82(3H,s,CH_3)	0.33(2H,s,$SiCH_2$),7.30-7.53(5H, m, SiPh) ,
209	1595	1319	276	1.25-1.73(22H,2C_6H_{11}), 0.38(2H,s,$SiCH_3$), 6.61-7.84(4H,dd,ArH)	0.33(2H,s,$SiCH_2$),7.32-7.55(5H, m, SiPh) ,
210	1636	1322	314	1.23-1.76(22H,2C_6H_{11}),0.37(2H,s,$SiCH_3$), 6.57-8.06(4H,dd,ArH)4.51(2H,s,CH_2O)	0.40(2H,s,$SiCH_2$),7.35-7.53(5H, m, SiPh) ,
211	1578	1286	292	1.21-1.75(22H,2C_6H_{11}), 0.33(2H,s,$SiCH_3$, 6.70-7.05(4H,dd,ArH),2.26(3H,s,CH_3),4.56(2H	0.35(2H,s,$SiCH_2$),7.32-7.53(5H, m, SiPh) , ,s,CH_2O)
212	1633	1326	307	1.21-1.74(22H,2C_6H_{11}), 0.32(2H,s,$SiCH_3$, 6.80-6.82(4H,m,ArH),3.74 (3H,s,CH_3),4.49(2H	0.33(2H,s,$SiCH_2$),7.31-7.52(5H, m, SiPh) , ,s,CH_2O)
213	1658	1330	328	1.21-1.70(22H,2C_6H_{11}), 0.31(2H,s,$SiCH_3$, 6.76(4H,dd,ArH)4.50(2H,s,CH_2O)	0.34(2H,s,$SiCH_2$),7.34-7.51(5H, m, SiPh) ,
214	1649	1330	319	1.21-1.74(22H,2C_6H_{11}), 0.31(2H,s,$SiCH_3$, 6.66-7.47(4H,dd,ArH),4.50(2H,s,CH_2O)	0.34(2H,s,$SiCH_2$),7.34-7.54(5H, m, SiPh) ,
215	1652	1326	326	1.21-1.72(22H,2C_6H_{11}),.032(2H,s,$SiCH_3$, 6.85-7.14(4H,dd,ArH),4.52(2H,s,CH_2O)	0.35(2H,s,$SiCH_2$),7.32-7.53(5H, m, SiPh) ,
216	1650	1329	321	1.22-1.75(22H,2C_6H_{11}), 0.32(2H,s,$SiCH_3$, 6.71-7.10(4H,m,ArH),2.29 (3H,s,CH_3),4.54(2H	0.34(2H,s,$SiCH_2$),7.31-7.54(5H, m, SiPh) , ,s,CH_2O)
217	1628	1295	333	1.25-1.81(22H,2C_6H_{11}), 0.35(2H,s,$SiCH_3$, 7.10-7.70(3H,m,ArH)	0.39(2H,s,$SiCH_2$),7.33-7.55(5H, m, SiPh) ,
218	1652	1322	320	1.24-1.80(22H,2C_6H_{11}), 0.38(2H,s,$SiCH_3$, 6.50-7.33(3H,m,ArH)	0.35(2H,s,$SiCH_2$),7.32-7.53(5H, m, SiPh) ,
219	1632	1324	308	1.25-1.82(22H,2C_6H_{11}), 0.40(2H,s,$SiCH_3$, 6.05-6.90(2H,dd,ArH),1.31 (9H,s,3CH_3)	0.40(2H,s,$SiCH_2$),7.30-7.55(5H, m, SiPh) ,
220	1556	1358	298	0.92(3H, t, CH_3, J=7.18), 1.26-1.95(28H, m, 3CH_2 and 2C_5H_{11}), 8.29(1H, s, CH)	
221	1559	1384	275	0.91(3H, t, J=7.13), 1.15-1.93(28H, m), 2.05(3H, s, C-CH_3)	
222	1580	1398	282	0.95(3H, t, J=7.06), 1.13-1.92(31H, m), 2.32(2H, q, J=7.19)	
223	1540	1382	258	0.91(6H, t, J=7.17), 1.19-1.93(32H, m), 2.31(2H, t, J=7.40)	
224	1545	1349	296	0.91(3H, t, J=7.18), 1.14-1.92(34H, m), 2.57(1H, m)	
225*	1538	1382	256	0.88-0.97(9H, m), 1.19-1.93(28H, m), 2.06(1H, m), 2.19(2H, d, J=6.26)	
226	1640	1335	305	0.93(3H, s, J=7.20), 1.30-1.98(28H, m), 2.40(3H, s), 7.22(2H, d, J=7.94), 7.97(2H, d, J=7.94)	
227	1640	1338	302	0.80-1.73(31H, m), 3.58(3H, s), 6.60(2H,d, J=8.4), 7.74(2H, d, J=8.4)	
228	1655	1332	323	0.80-1.73(31H, m), 3.58(3H, s), 6.62-7.32(4H, m)	
229	1642	1331	311	0.81-1.74(31H, m), 7.0(1H,s, OH), 6.52(2H,d, J=6.0), 7.56(2H, d, J=6.0)	
230	1632	1348	284	0.80-1.73(31H, m), 7.31(1H, m), 8.07-8.23(2H, dd), 8.65(1H, d)	
231	1606	1374	232	0.80-1.67(31H, m), 3.77(2H, s, NH_2), 5.77(2H, d), 7.33(1H, d)	

Table 2: (continued)

	IR(cm^{-1})			NMR(δ, ppm)
	asym νCO_2	sym νCO_2	$\Delta\nu CO_2$	
232	1616	1342	274	0.83-1.80(31H, m), 6.42-6.70(2H, m), 7.13(1H, m), 7.60(1H, d)
233	1636	1358	278	0.83-1.83(31H, m), 6.97(2H, m), 7.69(2H, m)
234	1630	1351	279	0.82-1.77(31H, m), 5.47(2H, s), 6.23-6.45(2H, m), 6.95(1H, m), 7.65(1H, m)
235	1587	1344	243	0.83-1.76(31H, m), 7.07(3H, s), 7.40(1H, t)
236	1631	1327	304	0.82-1.72(31H, m), 3.63(3H, s), 6.58-7.40(4H, m)
237	1595	1380	215	0.83-1.72(31H, m), 3.85(2H, s), 6.33(2H, d, J=8.5), 7.57(2H, d, J=8.5)
238	1605	1354	251	0.89(3H,t, J=7.18), 1.23-1.96(28H, m), 6.43(1H, m), 7.06(1H, t), 7.49(1H, d)
239	1606	1351	255	0.89 (3H,t, J=7.18), 1.22-1.95(37H, m), 6.02(1H, m), 6.94(1H, m)
240	1637	1330	307	0.96-2.04(33H, m), 2.98(2H, d), 3.70(1H,t), 6.8-7.2(5H, m), 7.32(15H, s)
241	1633	1322	311	0.96-2.04(33H, m), 2.96(2H, d), 3.68(1H,t), 6.86(4H, s), 2.24(3H,s), 7.36(15H, s)
242	1633	1315	318	0.96-2.04(33H, m), 2.96(2H, d), 3.67(1H,t), 6.96(4H,m), 7.36(15H, s)
243	1634	1317	317	0.96-2.04(33H, m), 2.90(2H, d), 3.68(1H,t), 6.56-7.2(9H, m), 7.36(15H, s)
244	1631	1320	311	1.00-2.08(33H, m), 2.96(2H, d), 3.74(1H,t), 6.52-7.0(4H, m), 3.74(3H, s) 7.38(15H, s),
245	1642	1323	319	1.00-2.04(33H, m), 2.88-3.08(2H, dq), 4.20(1H,q), 6.4-7.08(4H, m), 3.24(3H, s), 7.36(15H, s)
246	1646	1312	334	0.96-2.04(33H, m), 2.96(2H, dq), 4.38(1H,q),6.92-7.20(4H, m), 7.36(15H, s)
247	1639	1310	329	0.92-2.04(33H, m), 2.96(2H, d), 3.70(1H,t), 6.64-7.00(4H, m), 7.38(15H, s)
248	1625	1318	307	0.88-2.04(33H, m), 2.98(2H, dq), 3.96(1H,q), 6.7-7.10(4H, m), 1.98(3H, s), 7.32(15H, s)
249	1629	1310	319	0.96-2.04(33H, m), 2.96(2H, d), 3.68(1H,t), 6.60-7.04(4H, m), 2.12(3H, s), 7.36(15H, s)
250	1548	1380	168	0.82(9H, t), 0.92-1.60(18H, m), 2.96(2H, d), 3.70(1H, t), 6.80-7.18(5H, m), 7.32(15H, s)
251	1545	1386	159	0.84(9H, t), 0.96-1.60(18H, m), 2.92(2H, d), 3.68(1H, t), 6.86(4H, s), 1.24(3H, s),7.34(15H, s)
252	1549	1372	177	0.84(9H, t), 0.96-1.80(18H, m), 2.92(2H, d), 3.67(1H, t), 6.96(4H, m), 7.36(15H, s)
253	1550	1374	176	0.84(9H, t), 1.00-1.80(18H, m), 2.90(2H, d), 3.70(3H, t), 6.60-7.20(9H, m), 7.38(15H, s)
254	1548	1378	170	0.62-1.96(27H, m), 2.94(2H, d), 3.76(1H, t), 6.80(4H, m), 3.76(3H, s), 7.38(15H, s)
255	1545	1369	176	0.84(9H, t), 1.00-1.68(18H, m), 2.96(2H, dq), 4.12(1H, q), 6.20-7.08(4H, m), 3.22(3H, s), 7.30(15H, s)
256	1553	1386	167	0.84(9H, t), 0.96-1.80(18H, m), 2.92(2H, dq), 4.34(1H, q), 6.80-7.2(4H, m), 7.36(15H, s)
257	1557	1376	181	0.84(9H, t), 0.96-1.60(18H, m), 2.92(2H, d), 3.68(1H, t), 6.64-7.0(4H, m), 7.36(15H, s)
258	1548	1386	162	0.60-1.80(27H, m), 2.96(2H, d), 3.92(1H, q), 6.64-7.08(4H, m), 1.96(3H, s), 7.30(15H, s)
259	1538	1369	170	0.84(9H, t), 0.96-1.80(18H, m), 2.92(2H, dq), 3.64(1H, t), 6.42-7.08(4H, m), 2.12(3H, s), 7.34(15H, s)
260	1562	1400	162	0.92(9H, m), 1.83-1.14(25H, m), 2.28(2H, t, J=7)
261	1640	1325	315	0.54(6H, t,J=7), 0.87-1.5 (23H, m) ,6.98-7.10(3H, m), 7.62-7.76(2H, m)
262	1640	1325	315	0.92(6H, t, J=7), 1.20-1.88(23H, m), 7.36(2H, m), 7.98(2H, d)
263	1650	1320	330	0.92(6H, t, J=7), 1.25-1.92(23H, m), 8.21(4H, s)
264	1565	1385	180	0.92(6H, t, J=7), 1.18-1.83(30H, m), 2.28(2H, t, J=7)
265	1640	1340	300	0.52(3H, t, J=7), 0.90-1.48(28H, m), 6.97(2H, d, J=6), 7.67(2H, d, J=6)
266*	1640	1325	315	0.92(3H, t, J=7), 1.24-2.02(28H, m), 7.36(2H, d, J=7), 7.98(2H, d, J=7)
267	1650	1320	330	0.92(3H, t, J=7), 1.20-2.40(28H, m), 8.22(4H, s)
268	1568	1385	183	2.58(6H, s, $3C_6H_5CH_2$), 6.82-7.14(15H, m, ArH), 8.20(1H, s, HCO)
269	1573	1395	178	2.64(6H, s, $3C_6H_5CH_2$), 6.78-7.12(15H, m, ArH), 2.00(3H, s, CH_3)
270	1575	1389	186	1.88(3H, t, CH_3), 2.02(2H, q, CH_2), 2.66(6H, s, $3C_6H_5CH_2$), 6.72-7.28(15H, m, ArH),
271	1564	1406	158	0.82(3H, t, CH_3), 1.32(2H, m, CH_2), 2.02(2H, q, CH_2), 2.60(6H, s, $3C_6H_5CH_2$), 6.72-7.28(15H, m, ArH)
272	1576	1406	170	0.92(3H, t, CH_3), 1.00-1.60(4H, m, $(CH_2)_2$), 2.082H, s, CH_2), 2.60(6H, s, $3C_6H_5CH_2$), 6.72-7.28(15H, m, ArH)
273	1586	1411	175	0.93(3H, t, CH_3), 1.08-2.10(8H, m, $(CH_2)_4$), , 2.60(6H, s, $3C_6H_5CH_2$), 7.10-7.36(15H, m, ArH)
274*	1562	1401	161	0.90(3H, t, CH_3), 1.30-1.82(10H, m, $(CH_2)_5$) , 2.24(2H, t, CH_2), 2.60(6H, s, $3C_6H_5CH_2$), 7.20-7.40(15H, m, ArH)
275	1603	1384	219	2.70(6H, s, $3C_6H_5CH_2$), 7.08-8.06(20H, m, ArH)
276	1600	1385	215	2.36(3H, s, CH_3), 2.60(6H, s, $3C_6H_5CH_2$), 7.04-7.86(19H, m, ArH)
277	1612	1418	194	2.60(6H, s, $3C_6H_5CH_2$), 3.80(3H, s, OCH_3), 7.04-7.72(19H, m, ArH)
278	1612	1381	231	2.68(6H, s, $3C_6H_5CH_2$), 6.80-8.00(19H, m, ArH)
279	1609	1384	225	2.76(6H, s, $3C_6H_5CH_2$), 7.00-7.86(19H, m, ArH)
280	1599	1364	235	2.70(6H, s, $3C_6H_5CH_2$), 6.92-7.68(19H, m, ArH)
281	1646	1335	311	2.66(6H, s, $3C_6H_5CH_2$), 6.76-8.00(19H, m, ArH)
282	1594	1384	210	2.76(6H, s, $3C_6H_5CH_2$), 6.68-8.00(19H, m, ArH)
283	1628	1343	285	2.86(6H, s, $3C_6H_5CH_2$), 3.96(2H, s, OCH_2), 7.30-8.15(20H, m, ArH)

Table 2: (continued)

	IR(cm^{-1})			NMR(δ, ppm)
	asym νCO_2	sym νCO_2	$\Delta\nu CO_2$	
284	1629	1386	243	0.58(s,9H),6.25(d,2H),7.15(d2H),7.32(d,2H)
285	1632	1380	252	1.27(m,15H),6.3(d,1H),7.7(d,!H),7.02(dd,2H),7.19(d,2H),7.32(d,2H)
286	1632	1374	258	0.8-1.6(m,27H),6.2(d1H),7.66(d1H), 6.8-7.2(m,3H),
287	1629	1392	237	6.26,(d1H), 6.97-8.0(m18H),
288	1638	1371	267	0.9-2.23(m 33H),6.2(d1H), 7.36(d1H), 6.8-7.2(m3H)
289	1641	1383	258	0.58(s9H),6.33(d,1H), 6.45(dd 1H), 6.55(d 1H),7.5(d 1H),7.73(d 1H)
290	1648	1382	266	1.25(m,15H),6.3(d 1H),7.05(dd 1H0, 7.2(d 1H),7.33(d 1H),7.53(d 1H)
291	1644	1386	258	0.66-1.82(m 27H),6.09-7.57(m, 5H),
292	1641	1381	260	6.32-790(m 20H)
293	1650	1395	255	0.19-2(m 33H), 6.28-7.60(m5H),
294				0.6(s,3H),2.35(s,3H), 6.46(d,1H),7.16(d,1H0, 7.25(t2H), 7.31(d,1H),7.59(d 1H)
295				0.9-1.65(m,27H),2.35(d1H),6.48(d1H),7.15(d1H),7.25(t 2H), 7.33(d1H),7.59(d 1H)
296				2.23(s 1H),6.77(d 1H), 7.26(d 1H), 7.35(t 2H),7.43(d 1H), 7.9(d 1H), 7.59-7.97(m15H)
297				1.33-1.92(m 33H),2.32(d 1H),6.48(d 1H),7.13(d 1H), 7.22(t 2H),7.32(d 1H), 7.58(d1H)
298	1614	1356	258	0.63(s 3H), 2.2(s 1H),2.3(s1H),6.66(dd 1H),6.8(d 1H), 6.9(1H), 7.0(dd1H), 7.2(dd 1H),8.0(d 1H),9.3(s1H)
299	1602	1348	254	1.1-1.9(m 27H),2.3(s 1H),2.5(s 1H), 6.7(dd1H),6.8(d 1H),6.9(d1H), 7.1(dd1H), 7.3(dd1H), 8.2(d1H), 9.3(s 1H)
300	1617	1362	255	2.2(s 1H), 2.3(s 1H), 6.6(dd1H), 6.8(d1H), 6.9(d 1H), 7.1(dd 1H),7.2(dd2H) ,7.57-7.98(m 15 H),8.1(d1H),9.5(s 1H)
301	1641	1392	249	1.29-2.00(m 33H),2.2(s 1H),2.3(s 1H),6.7(dd 1H), 6.8(d1H)6.9(d1H),7.0(dd1H), 7.2(dd2H), 8.0(d 1H),9.5(s1H)
302	1580	1380	198	2.3(s1H), 2.3(s1H), 2.75(s 2H), 6.71(dd1H), 6.81(d1H),6.85(d1H), 7.0(dd1H),7.2(dd1H),7.3(dd1H),8.2(d1H),9.4(s1H)
303	1546	1380	166	0.56(s1H), 3.8(s2H),6.93(dd1H),6.94(d1H), 7.09(dd1H),7.12(dd,1H), 7.24(dd,1H),7.33(d,2H),
304	1560	1390	170	0.611.62(m,27H),3.8(s,2H),6.92(dd,1H),6.95(d,1H),7.09(dd,1H),7.12(d,1H),7.24(dd,1H) ,7.33(d,2H)
305	1565	1395	170	3.8(s ,2H),6.5(dd,1H),6.97(d,1H), 7.13(dd,1H), 7.22(d,1H) 7.25(dd,1H),7.36(d,2H),7.5-7.73(m,15H)
306	1570	1380	190	2.36(s,2H),3.8(s2H), 6.66(dd,1H),6.98(d,1H), 7.18(dd,1H), 7.28(d ,1H), 7.35(dd,1H0), 7.42(d,2H),7.6-7.71(m,15H)
307	1632	1386	246	1.05(s,6H), 6.42(d.2H), 7.02(dd,2H), 7.27(d,2H), 7.38(d,2H),7.91(d,2H)
308	1626	1370	256	1.34-1.7(m,18H),6.27(d,1H),7.05(dd,2H),7.23(d,1H), 7.37(d,1H), 7.86(d1H),
309	1617	1371	246	6.28(d,1H),7.0(dd1H),7.23(d1H),7.35(d,1H), 7.55-7.79(m15H)7.86(d 1H)
310	1628	1376	252	1.32(t,3H),1.88(m,2H), 6.25(d,1H), 7.03(dd,2H), 7.22(d,1H), 7.6(d,1H), 7.85(d,1H)
311	1641	1377	264	1.12(s,3H), 6.35(d,1H), 6.45(dd,1H), 6.65(d,1H), 7.5(d,1H), 7.52(d,1H),
312	1644	1388	258	0.92(-1.72(m,27H),6.4(d,1H), 6.45(dd,1H), 6.64(d,1H), 7.5(d,1H), 7.55(d,1H),
313	1640	1378	262	6.43(dd,1H), 6.45(d,1H), 6.55(d,1H), 7.48(d,1H), 7.55(d,1H), 7.55-7.78(m,15H)
314	1639	1379	260	1.3(t,3H), 1.69(m,2H), 6.32(d,1H), 6.42(dd,1H), 6.56(d,1H), 7.45(d,1H), 7.49(d,1H),
315				1.1(s,3H), 2.29(s,1H), 6.42(d,1H), 7.12(d,1H), 7.19(t,1H), 7.26(d,1H),7.68((d,1H),
316				0.9-1.82(m,27H), 2.36(s,1H), 6.48(d,1H), 7.18(d, 1H), 7.27(t,1H), 7.33(d,1H), 7.76(d,1H),
317	1608	1368	240	1.20(s,3H), 2.2(s,1H), 2.3(s,1H), 6.7(dd,1H), 6.8(d,1H), 7.0(d,1H), 7.19(dd,1H), 7.3(dd,2H),8.1(d,1H),9.1(s,1H),
318	1600	1350	250	0.96-1.8(m,27), 2.2(s,1H), 2.3(s,1H), 6.7(dd,1H), 6.9(d,1H), 7.0(d,1H), 7.1(dd,1H), 7.3(dd,2H), 8.2(d,1H), 9.3(s,1H)

Table 3: ^{13}C and ^{119}Sn NMR data for the organotincarboxylates.

	$\delta^{13}C$										$\delta^{119}Sn$	$J(^{\delta 119}Sn-^{13}C)$
	C=O										(ppm)	(Hz)
1	175.25	69.67	16.20	58.29	27.30	26.54	13.11				116.1	358.88
2	175.03	67.93	16.14	66.04	27.30	26.65	14.52	13.06			114.4	368.00
3	175.09	72.65	16.20	68.31	27.41	26.87	22.43	13.22	10.02		115.06	363.28
4	175.36	71.08	16.52	68.58	27.68	26.82	31.63	19.07	13.71	13.43	109.95	361.20
5	175.20	69.61	16.41	68.53	38.19	27.57	27.14	26.71	24.56	22.37	113.97	361.34
			13.38									
6	175.20	71.13	16.25	68.37	31.37	29.53	27.47	26.71	25.42	22.65	113.97	358.90
			13.22	13.65								
7	175.56	71.67	16.41	65.82	27.63	26.82	21.62	13.83			114.48	361.34
8	175.20	71.18	16.31	68.42	29.04	27.52	27.03	26.71	22.21	13.27	116.67	358.90
9	173.35		16.57	27.62	26.86	13.48					128.10	351.60
10	172.35		16.57	27.57	26.80	13.43					129.30	351.60
11	173.78	65.76	16.68	156.01	114.35	129.74	130.28	27.73	26.97	20.42	128.40	351.60
			13.59									
12	173.43	37.59	16.57	136.24	129.52	129.97	132.39	27.60	26.97	20.96	122.30	354.00
			13.59									
13	172.59	2.76		139.68	135.29	133.29	133.35	131.25	136.60	129.61	107.36	291.75
		-0.51										
14	171.29	1.39	142.32	138.91	138.49	134.49	132.20	124.12	128.12	127.77	104.81	292.97
		-1.91										
15	170.99	1.29	162.65	138.31	134.22	132.01	129.15	127.79	127.67	113.13	102.85	291.97
		-1.93										
16	170.09	1.38	162.74	138.18	134.19	132.62	129.20	127.84	128.30	115.06	109.49	291.75
		-1.88										
17	170.09	1.39	138.34	138.17	134.17	131.51	130.52	129.22	128.15	127.84	119.91	290.53
		-1.88										
18	171.69	2.69	139.39	139.60	138.34	135.40	132.99	130.51	129.13	100.95	112.40	290.53
		-0.55										
19	168.74	1.68	149.89	137.93	137.72	134.12	130.98	129.26	127.85	122.95	122.21	292.97
		-1.84										
20	171.38	1.33	150.09	139.24	138.42	134.21	129.28	127.77	132.18	121.70	97.32	292.97
		-1.92										
22	171.32	1.56	5.24	132.50	130.04	128.05	131.89				139.27	141.49
23	171.43	1.55	5.21	142.28	130.10	128.78	129.76				136.02	141.49
24	171.07	1.45	5.20	162.65	113.29	131.95	124.94				133.86	141.49
25	170.25	1.52	5.22	128.73	115.02	132.39	165.23				142.50	141.49
26	170 10	1.56	5.31	131.02	128.36	131.39	138.24				145.12	Not obser
27	171.31	1.31	5.13	137.96	123.01	130.65	149.77				156.83	141.49
28	174.54	1.51	5.59	161.91	114.49	117.05	130.8	118.52	134.68		155.94	138.72
29	175.90	1.57	5.33	160.03	132.81	132.33	115.43				145.57	141.49
30	170.94	1.48	5.10	159.04	111.75	119.72	132.07	122.24	132.34		131.15	141.49
31	171.06	1.51	5.19	154.25	122.47	114.18	118.78	133.81	129.0		140.37	141.49
32	170.39	1.45	5.28	131.58	131.58	131.36	126.89				99.39	141.49
33	168.96	1.46	5.22	132.18	148.53	130.51	123.30	129.63			163.04	135.94
34	168.48	1.57	5.21	134.37	135.38	148.11	129.06	124.74	126.15		156.89	138.72
35	169.07	1.53	5.33	134.66	136.91	130.54	132.72	130.54	126.57		150.74	138.72
36	166.19	34.02	30.33	28.49	26.59	15.75	27.74	27.04	13.43		79.19	327.50
37	176.62	33.63	30.31	28.46	26.61	15.29	27.77	27.00	13.39		79.10	330.48
38	179.68	33.53	30.29	28.44	26.61	15.20	27.75	26.95	13.34		77.01	330.48
39	179.14	33.60	30.33	28.48	26.65	15.27	27.80	27.00	13.40		77.01	333.46
40	182.28	33.42	30.22	28.38	26.58	15.10	27.68	26.86	13.29		75.11	333.46
												(318.58)
41	178.52	33.65	30.38	28.51	26.68	15.31	27.84	27.04	13.45		77.33	333.46
												(318.58)
42	170.27	33.87	30.38	28.46	26.62	15.52	27.79	27.00	13.39		89.63	330.48
												(315.60)
43												

Table 3: ^{13}C and ^{119}Sn NMR data for the organotincarboxylates.

	$\delta^{13}C$										$\delta^{119}Sn$ (ppm)	$J(^{\delta 119}Sn-^{13}C)$ (Hz)
	C=O											
44	171.09	33.72	30.38	28.48	26.66	15.43	27.82	27.00	13.43		81.42	330.48 (315.60)
45	171.11	33.72	30.38	28.51	26.68	15.52	27.84	27.04	13.50		83.97	327.50
46												
47	171.80	33.72	30.42	28.52	26.71	15.47	27.87	27.04	13.49		77.46	330.48
48	171.18	33.88	30.40	28.49	26.65	15.53	27.83	27.03	13.46		87.97	330.48
49	168.69	34.05	30.34	28.45	26.57	15.69	27.72	26.98	13.38		96.47	327.50
50	174.27	34.40	30.39	28.55	26.65	16.01	27.77	27.06	13.48			324.52 (309.64)
51	173.22	33.88	30.49	28.61	26.78	15.56	27.95	27.12	13.56			330.48 (315.60)
52	174.19	34.17	30.37	28.54	26.68	15.85	27.79	27.03	13.49		94.44	324.52
53	163.28	34.24	30.38	28.52	26.64	15.79	27.98	27.07	13.47		99.31	324.52
54	167.74	34.06	30.41	28.53	26.68	15.65	27.83	27.06	13.50		92.81	327.50
55	182.05	34.37	30.38	28.51	26.61	15.97	27.95	27.04	13.47		106.09	309.64
56	172.75	-0.59	139.5	127.5	65.11	114.2	129.0	120.8	129.0	114.2	147.2	271
		3.19	132.9	128.7	157.6							
57	172.48	-0.43	139.7	127.7	65.60	115.7	129.1	126.1	129.1	115.7	151.1	271
		3.41	133.1	128.9	156.4							
58	172.32	-0.43	139.6	127.6	65.49	116.1	131.9	113.1	131.9	116.1	150.3	272
		3.41	133.1	128.8	157.9							
59	172.43	-0.32	139.7	127.7	65.44	116.8	137.8	83.2	138.8	116.8	151.5	271
		3.46	133.1	128.9	157.8							
60	173.08	-0.43	139.7	127.6	65.44	114.2	129.0	129.9	129.0	114.2	147.1	260
		3.35	133.0	128.5	155.7							
61	*	-0.27	139.8	127.9	65.77	114.5	125.7	141.8	125.7	114.5	157.3	
		3.74	103.2	129.1	162.9							
62	173.02	-0.49	139.7	127.6	65.22	115.1	139.0	121.8	128.8	111.3	147.7	266
		3.30	133.1	128.8	157.8							
63	173.32	-0.43	139.7	127.6	66.14	130.6	114.3	122.8	129.1	133.1	151.0	270
		3.42	133.0	128.8	153.5							
65	173.41	-0.38	139.9	127.7	65.32	130.7	120.3	126.8	126.4	110.8	147.4	240
		3.47	133.2	128.9	156.2							
66	172.16	-0.27	139.8	127.9	66.58	133.8	127.0	126.1	130.0	114.0	154.4	272
		3.68	133.2	128.0	152.6							
67	171.37	-0.27	140.0	127.8	69.61	129.9	128.2	128.7	128.2	129.9	150.8	
		3.63	133.2	129.0	149.6							
68	173.08	-0.54	139.7	127.6	66.47	145.7	112.2	128.0	120.0	113.2	146.8	264
		3.30	133.0	128.7	149.1							
69	174.71	-0.22	140.1	127.9	70.37						139.3	288
		3.52	133.1	129.0	58.94							
70	174.98	-0.27	140.1	127.8	68.64	15.06					140.3	292
		3.47	133.3	128.9	66.69							
71	174.65	-0.49	139.7	133.0	72.8	22.48	10.18				141.5	276
		3.25	127.5	128.7	68.31							
72	174.93	-0.27	140.0	127.7	71.1	31.58	19.18	13.87			140.3	284
		3.41	133.2	128.9	68.85							
73	175.03	-0.22	140.2	127.9	71.6	29.31	28.22	22.54	14.03		139.5	280
		3.52	133.3	129.0	68.96							
74	171.13	-0.05	140.3	127.9	125.8	133.3	162.8	133.3	132.1		125.3	272
		3.68	133.3	128.9	132.1							
75	171.38	0.00	140.3	128.0	130.2	128.1	132.6	128.1	132.1		130.2	278
		3.68	133.4	128.0	132.1							
76	169.02	-0.05	140.3	128.0	128.5	115.1	165.3	115.1	132.6		133.8	290
		3.79	133.4	128.1	132.6							
77	170.32	-0.16	140.0	128.0	130.7	128.2	138.2	128.2	131.4		135.7	298
		3.58	133.3	128.9	131.4							

Table 3: ^{13}C and ^{119}Sn NMR data for the organotincarboxylates.

		$\delta^{13}C$									$\delta^{119}Sn$ (ppm)	$J(^{119}Sn-^{13}C)$ (Hz)
	C=O											
78	170.38	-0.11	140.2	127.9	128.3	131.7	127.0	131.7	131.2		136.1	
		3.68	133.2	129.0	131.2							
79	169.02	-0.43	140.0	128.0	138.0	123.2	150.1	123.2	131.1		147.0	278
		3.85	133.3	128.2	131.1							
80	170.97	-0.22	140.5	128.0	128.3	111.7	132.6	114.8	132.4		124.3	
		3.63	133.3	128.9	159.2							
81	170.38	-0.16	140.0	128.0	145.4	111.4	146.8				142.9	
		3.74	133.3	129.0	116.7							
82	166.73	34.26	30.46	28.54	26.61	-6.65						294.76
83	177.00	33.95	30.33	28.46	26.62	-7.94	21.10					273.92
84	179.70	33.11	30.43	28.48	26.70	-7.68	27.86	9.90				
85	174.11	32.93	30.44	28.48	26.71	-7.69	36.59	19.94	13.66			
86	179.38	33.57	30.40	28.51	26.69	-7.89	34.43	27.89	22.35	13.67		264.98
87	179.47	33.63	30.49	28.54	26.72	-7.86	34.71	13.48	25.50	2.32		267.86
							13.88					
88	182.67	33.45	30.33	28.45	26.65	-7.82	34.31	19.65				288.80
89	178.86	33.58	30.41	28.50	26.68	-7.08	43.97	26.06	22.41			291.78
90	171.39	37.58	30.30	28.39	26.56	-7.66	131.74	129.95	127.74		75.21	270.94
91	170.20	33.63	30.25	28.33	26.50	-7.62	137.94	131.29	130.26		79.98	264.98
							127.91					
92	168.89	33.87	30.21	28.29	26.42	-7.42	149.64	137.65	130.81		91.34	267.96
							122.81					
93	171.05	33.50	30.28	28.34	26.53	-7.78	162.47	131.86	124.17		71.87	270.94
							112.95					
94	172.23	33.71	30.29	28.32	26.48	-7.46	160.41	132.19	122.98		81.49	264.98
							114.92					
95		33.57	30.29	28.37	26.56	-7.72	142.23	130.05	128.52		73.38	270.94
							21.27					
96	171.56	33.48	30.31	28.37	26.56	-7.77	150.14	131.89	113.38		67.75	270.94
97	170.16	33.60	30.24	28.29	26.47	-7.73	165.00	132.20	128.06		78.54	276.90
							114.66					
98	169.56	33.95	30.38	28.48	26.62	-7.18	136.75	134.32	132.57		90.26	269.60
							130.90	130.33	126.50			
99	167.80	33.83	30.38	28.46	26.63	-7.51	163.48	144.38	117.83		98.07	256.04
							104.15	32.88	28.81			
137	173.35	34.07										
138	172.71	34.07										
139	172.81	34.12										
140	173.02	34.12										
141	172.16	34.07										
142	172.22	34.13										
143	172.81	34.02										
144	172.65	33.96										
146	173.46	33.96										
147	173.51	34.02										
148	172.21	34.18										
149	171.18	34.12										
151	173.58	34.22	28.59	-7.13	158.09	129.37	121.28	114.66			95.56	266.34
		30.44	26.72	65.51								
153	173.78	34.02	28.49	-7.28	156.27	130.81	127.10	126.50	120.97	111.13	94.15	266.34
		30.37	26.65	65.86								
160	173.81	34.03	28.49	-7.39	154.12	152.29	115.56	114.48	66.35		93.23	266.31
		30.36	26.61	65.61								
164	172.57	33.76	28.21	-7.45	153.57	130.03	107.00	122.70	121.49	113.21	95.72	266.34
		30.04	26.34	66.11								
165	172.84	34.03	28.49	-7.36	156.55	128.94	125.88	115.75			96.83	266.34
		30.36	26.61	65.63								

Table 3: ^{13}C and ^{119}Sn NMR data for the organotincarboxylates.

		$\delta^{13}C$									$\delta^{119}Sn$ (ppm)	$J(^{\delta 119}Sn-^{13}C)$ (Hz)	
	C=O												
167	172.88	33.35	28.34	-7.34	157.10	131.91	116.26	113.17			95.52	266.34	
		30.22	26.47	65.62									
169	172.53	34.17	28.53	-7.22	158.03	138.11	117.04	83.35			94.75	266.34	
		30.41	26.65	65.64									
170	172.25	34.01	28.30	-7.35	158.50	148.84	129.64	121.61	115.86	108.62	99.71	266.34	
		30.18	26.80	65.63									
203	170.95	-0.12	34.60	28.48	140.60	127.50	131.86	127.70	127.70	129.91	63.22	382.86	
		-3.30	30.23	26.50	132.91	128.55	129.91	131.59					
204	171.16	-0.07	34.63	28.54	140.74	127.55	141.95	127.99	127.99	130.04	61.05	382.86	
		-3.33	30.29	26.56	133.00	128.50	130.04	129.17					
205	169.95	-0.14	34.66	28.42	140.51	127.50	137.92	127.94	127.94	131.25	69.62	377.30	
		-3.24	30.19	26.41	132.90	128.56	131.25	130.42					
206	169.94	-0.16	34.60	28.43	140.56	127.50	128.04	114.41	114.41	132.63	62.27	399.50	
		-3.32	30.19	26.44	132.90	128.55	132.62	162.45					
207	168.95	0.11	35.11	28.62	140.53	127.77	137.91	123.08	123.08	130.97	80.48	393.96	
		-2.68	30.42	26.62	133.11	128.88	130.97	149.88					
208	170.97	0.00	34.70	28.57	140.95	127.62	128.08	113.11	113.11	131.96	60.66	381.86	
		-3.31	30.35	26.61	133.06	128.63	131.96	124.46					
209	171.41	-0.02	34.57	28.54	141.09	127.56	128.09	131.95	131.95	113.39	55.82	399.50	
		-3.53	30.32	26.60	133.06	128.57	113.39	150.21					
210	169.40	-0.04	34.98	28.59	139.04	127.93	140.07	126.02	126.02	119.09	85.46	377.30	
		-1.60	30.48	26.56	133.12	129.13	119.09	128.21					
211	173.34	-0.07	34.91	28.56	140.63	127.70	128.81	114.38	114.38	65.74	80.48	*	
		-2.59	30.29	26.56	133.12	128.43	129.62	156.00	129.62				
212	172.66	-0.07	34.95	28.66	140.25	127.69	128.85	116.92	116.92	66.42	85.66	*	
		-2.48	33.24	26.51	133.09	128.84	137.95	157.99	137.95				
213	172.70	0.00	33.58	28.60	140.50	128.18	128.42	116.36	116.36	65.69	83.09	*	
		-2.21	33.94	26.99	133.10	128.86	132.03	157.22	132.03				
214	173.48	0.00	34.03	28.66	140.56	127.77	154.12	115.48	115.48	66.29	79.18	384.40	
		-2.13	30.35	26.65	133.18	128.49	114.43	127.77	114.43				
215	172.70	-0.01	35.03	28.65	140.56	127.82	158.86	134.72	114.81	65.65	64.02	391.76	
		-2.41	30.36	26.62	133.18	128.93	130.03	121.18	113.33				
216	173.42	-0.04	34.99	28.71	140.67	127.82	158.20	139.24	127.63	65.54	79.70	391.76	
		-2.50	30.40	26.68	133.24	128.93	115.25	121.78	111.67				
217		0.05	35.03	28.66	140.94	127.77	136.70	127.40			58.43	388.20	
		-2.99	30.42	26.68	133.18	128.82	131.49	132.18					
218		0.03	35.09	28.66	140.83	127.58	146.63	111.39			76.49	*	
		-2.77	30.40	26.66	133.18	128.82	116.64	145.24					
219		-0.05	34.93	28.61	141.06	127.66	144.69	104.24			73.61	393.96	
		-3.43	30.40	26.63	133.22	128.71	117.74	141.06					
220	166.32	34.22	28.63	15.17	27.22								375.14
		30.59	26.64	27.91	13.40								
221	176.50	33.57	28.60	14.36	27.22	21.08					46.52	300.7	372.16
		30.57	26.67	27.94	13.39								
222	179.80	33.50	28.60	14.32	27.19	29.23	9.99				45.80	301.6	369.18
		30.58	26.68	27.91	13.40								
223	179.13	33.54	28.60	14.35	27.23	30.66	27.88	22.30	13.59		45.47	303.6	372.16
		30.57	26.68	27.98	13.43								
224	182.45	33.45	28.61	14.26	27.17	34.41	19.64				44.56	300.7	372.16
		30.57	26.71	27.95	13.43								
225	178.45	33.55	28.63	14.37	27.23	44.01	25.99	22.36			45.60	300.7	372.16
		30.63	26.71	28.00	13.43								
226	171.44	33.82	28.73	14.64	27.30	142.14	130.17	129.38	128.60		52.21	300.7	369.18
		30.73	26.81	28.09	13.55								
227	170.92	33.57	28.51	14.38	27.08	162.5	131.8	124.3	112.9		49.89	299.8	371.52
		30.53	26.60	27.87	13.32	54.83							

Table 3: ^{13}C and ^{119}Sn NMR data for the organotincarboxylates.

	$\delta^{13}C$										$\delta^{119}Sn$ (ppm)	$J(^{\delta 119}Sn-^{13}C)$ (Hz)	
	C=O												
228	168.71	34.01	28.44	14.71	27.01	147.8	135.5	133.9	128.8		69.97	291.9	360.9
		30.45	26.48	27.74	13.24	126.0	124.7						0
229	170.93	33.70	28.51	14.48	27.09	159.2	133.3	128.7	122.4		52.60	299.8	368.8
		30.54	26.59	27.87	13.34	118.2	114.3						6
230	171.49	33.57	28.56	14.42	27.14	150.29	131.86	121.09	113.33			302.5	371.5
		30.58	26.66	27.94	13.40								2
231	170.97	33.58	28.54	14.49	27.14	158.9	132.0	131.7	122.4			299.8	368.8
		30.53	26.62	27.90	13.40	119.7	111.7	55.68					6
232	172.52	34.08	28.69	14.91	27.30	160.77	132.38	123.20	115.17		56.14	283.9	366.2
		30.76	26.76	28.04	13.54								2
233	173.98	34.02	28.56	14.82	27.12	163.0	152.8	132.6	106.1		46.16	297.2	363.5
		30.53	26.62	27.82	13.39	104.7	100.3						6
234	174.07	34.53	28.57	14.18	27.14	161.4	134.4	131.1	118.3		60.68	294.5	360.9
		30.54	26.59	27.82	13.37	116.8	114.3						0
235	171.67	34.14	28.75	14.03	27.37	140.6	138.6	131.2	130.8		62.81	294.7	363.2
		30.76	26.79	28.09	13.61	127.6	94.0						4
237	170.58	33.87	28.52	14.72	27.11	132.9	132.7	131.2	130.3		67.78	291.9	363.5
		30.51	26.56	27.83	13.35	126.0							6
238	163.23	34.18	28.67	14.88	27.28	146.57	145.15	116.63	111.35		60.58	318.5	360.2
		30.62	26.70	27.98	13.49								6
239	167.74	33.99	28.66	14.73	27.25	163.4	144.6	117.7	104.1		32.93		363.2
		30.63	26.74	27.99	13.50	26.74							4
258											107.2		
259											107.4		
260	177.04	34.07	15.17								78.17	395.	332.0
261	171.4	33.85	15.55								86.79	376.	329.6
262	170.4	33.86	15.55								90.30	381.	327.2
263	168.7	33.97	15.55								100.1	383.	324.7
264	178.98	33.49	14.30								45.51	371.	295.0
265	171.2	33.74	14.57								53.69	368.	300.0
266	170.3	33.80	14.63								58.22	367.	300.3
267	168.9	34.02	14.84								69.55	361.	307.6
269	177.79	23.94	138.68	128.60	127.79	124.43	20.91				-18.55	322.26	
271	179.74	23.78	138.62	128.44	127.63	124.16	36.02	18.85	13.85		-21.04	318.60	
275	172.32	24.10	138.68	128.17	127.96	124.43	132.45	130.28	128.10	131.04	-14.53	316.16	
276	172.33	24.08	138.41	128.80	127.92	124.96	132.85	130.63	130.01	141.18	-16.78	316.54	
277	172.37	24.05	138.79	128.29	127.84	124.38	128.10	132.29	123.24	153.37	-18.99	317.38	
278	171.36	24.16	138.57	128.71	127.19	124.54	115.73	132.56	114.73	159.91	-11.83	308.83	
279	171.29	24.16	138.52	128.71	127.90	124.54	131.69	129.63	128.44	138.79	-9.83	314.94	
280	171.30	24.10	138.61	128.72	127.63	124.51	136.56	132.19	138.84	100.15	-9.56	312.78	
281	169.50	24.16	138.84	128.49	127.74	124.43	138.14	130.84	122.97	149.78	-2.77	311.27	
283	174.38	24.10	138.14	128.71	127.84	124.40	129.13	119.12	114.57	150.21	2.55	310.05	
284	171.7	-2.24,	118.78	127.73	127.8	129.9	136.4	139.92			132.9		
286	171.7	13.65	16.49	22.67	27.81	119.03	127.62	127.82	129.92	136.26	111.2		
289	172	2.3	112	113.7	117.6	130.7	144	151.2			133	400	
290	175.1	7.9	9.9	111.9	113.5	117.6	130.5	144.2	151.3		106	369	
291	172	13.6	16.9	26.9	27.8	112	113.5	117.9	130.5	144.2	104	358	
										151.4			
292	172	112.1, 112.2, 116,128.8,130.1,132.1,136.8,137.2.,144.7,151.1									-144	648	
293	171.8	26.9,29.3,31.3,33.7,112,113.3,118.2,130.2,144.1,151.5									12	344.6	
294	172	-2.2,21.2,119.65,125,128.5,128.6,130.55,134.7,138.3,144.2,									129	402	
295	172	13.59,16.49,21.25,27.,27.82,119,125,128.5,128.58,130.44,134.9, 138,143									107.9	362	
296	173.2	21.16,117.95,125.1,128.34, 128.59,128.79,130.82,134.49,136.7,138.25,138.42,145.77									-114.	659	
297	171.8	21.22,26.96,28.96,31.1,33.96,120.23,125,128.5,128.55,130.3,135.19,138.23,143.56,									12	340	

Table 3: ^{13}C and ^{119}Sn NMR data for the organotincarboxylates.

	C=O	$\delta^{13}C$	$\delta^{119}Sn$ (ppm)	$J(^{119}Sn-^{13}C)$ (Hz)
298	173.5	- 2.17,14.0,20.6,111.5,113,113.5,115.9,122.4,125.7,126,131.9,132.8,133.4,138,139.4, 148.9	133.4	199
299	173.5	13.7,13.8,16.6,25.9,27.7,113.2,115.8,122.4,125.6,126,131.7,132.9,133.2,137.7,139.3 ,148.8	111.2	352.6
300	177.5	13.5,20.5,113.1,113.5,116,122.9,126,126.5,129,130,132,133.5,134,134.2,136.5,138. 5,139,140,149.2,	116.5	6.50
301	173.3	13.9,20.6,26.9,28.9,31.2,33.9,113.1,113.4,115.8, 122.7,125.7,126.1,131.9,133,133.2,138,139.5,148.9	12	341.2
302	174.8	13.2,13.5,20.1,20.9,22.4,112.9,114.1,116.3,122.3,125.9,126.6,128.7,132.3,133.,133. 8,135,138.9,139.1,139.9,150.4		263
303	177.4	-2.85,117.99,121.8,123.6,125.8,127.4,128.8,129.3,130.7,138.,142.,	141.7	398
304	177.9	13.6,16.4,27,27.78.118,121.8,123.6,126,127.4,128.8,129.5,130.8,138.2,142.9		361.9
305	177.5	118.2,121.6,123.7,125.1,127,128,128.7,129.2,129.8,130.7,132,136.9,138.7,138.9,14 0,		649
306	179.1	26.9,112.8,116.8,119.7,122.2,123,125.3,127.8,128.6,129.7.,130.2,130.6,138.3,142.1		
308	175.8	13.43,25.2,26.21,26.54,116.43,127.9,128.6,130.8,138.5,139.4,	-150	
309	175.8	116.46,128.2,128.8,130,130.6,134,134.8,137.6,138.6,139.4,	-202	
310	175.7	8.81,17.58,116.32,127.87,128.85,130.84,138.58,139.38,	-157.	605
311	175.1	4.5,111.9,115,115.4,132.9,144.1,150.7	-123	655
312	175.7	13.3,25,26,26.4,112,114.8,115.2,132.2,144.7,150.6,	-142	592
313	176.5	113.1,115.5,115.7,129.2,132.9,135.5,135.8,138,144.8,151.5,	-204	
314	176.3	8.8,17.4,112.2,114.9,115.2,132.5,144.9,150.8	-155	609
315	176	5.2,21.2,117,125.4,128.5,128.8,131.5,134.3,138.5,147.,	-140	633
316	175.7	13.4,25.4,26.2,26.6,117.4,125.6,128.7,128.8,131.2,134.4,138.5,146.,	-153	569
317	177.3	5.0,19,20.6,111,113 113.6,116.2,122.6,125.8,126.5,132,133.2,134.5,138.2,138.8,149.4,	-119	659
318	177.4	13.6,13.9,20.7,25.9,26.6,26.9,111.3,113.4,116.2,122.6,125.8,126.41,131.9,133.4,134 .5,138.1,138.9,149.3		589-2.24

* ^{29}Si NMR, number missing data is not available.

100-117 ^{119}Sn and ^{29}Si NMR , (117.93, 7.47) (117.47,-7.36), (116.75,7.40),(116.30,-7.33),(116.49,-7.43),(117.54,-7.47),(116.49,-7.22),(116.38,-7.47),(143.35-7.54),(142.53,-7.57),(145.57,-7.60), (144.85,-7.58),(145.13,-7.65),(114.12,-7.56)(158.07,-7.54),(146.23,-7.60),(148.35-7.67

240-258 ^{119}Sn NMR 66.16,65.95 14.39,12.88, 11.38,9.55,14.39, 13.08 10.9,11.18,108.3,107.4,110.7,109.1,107.6,105.2,110.1,109.7,107.2.

disorder in the structural refinement. Of particular interest is the mode of O 5 interactions. It forms an intramolecular contact with the tin atom of the same molecule, whereas an intermolecular interaction is envisaged with the tin atom of a symmetry related unit in the lattice. These intra and inter molecular interactions result in the formation of one dimensional. polymer.

The crystal structure of $Me_3Sn(CPTA)H_2O$ (CPTA = 4-(p-chlorophenyl)-2-phenyl-5-thiazole acetate) consists of discrete molecular units in which one molecule of water {O(3)} is coordinated to tin along with the deprotonated oxygen of the monodentate ligand{O(1)}(Fig.3).

The coordination environment around tin atom is distorted trigonal bipyramidal with the three methyl groups occupying the equatorial sites and the oxygen atoms of a water and of monodentate CPTA ligand occupying the axial position. The near linearity of the angle O(1)-Sn(1)-O(3)(178.0)(2) reflects the strength of coordination of the water molecule.

References

1. K.C. Molloy, T. G. Purcell, M. F. Mahon and E. Minshall; *Appl. Organomet. Chem.*, **1**, 507 (1987).
2. F. Huber, B. Mundus-Glowacki and H. Preut; *J. Organomet. Chem.*, **365**, 111 (1989).
3. E. R.T. Tiekink; *Trends in Organomet Chem.*, **1**,71 (1994).
4. M. Gielen, A. El. Khloufi, M. Biesemans, F. Keyser and R.Willem; *Appl. Organomet. Chem.*, 7, 201 (1993).

5. G. K. Sandhu and N. S. Beardy; *J. Organomet. Chem.*, **423**,183 (1992).
6. A Glowacki, F. Huber and H. Preut; *J. Organomet. Chem.*, **306**, 9 (1986).
7. M. Gielen, J. M. Piret, M. Biesemans, R. Willem and A. El. Khloufi; *Appl. Organomet. Chem.*, **6**, 59 (1992).
8. Xie Qing-Lan, Li Jing, Jia Zhi-Fen, Zhang Zhao-Gui and Hu Jin-Min, Chem., *J. Chin. Univ.*(Chinese), **12**, 1186 (1991).
9. Xie Qing-Lan, Xu Xiao-Hua and Xie Xiao-Juan; *Youji Huaxue* , **13**, 264 (1993).
10. Xie Qing-Lan, Xu Xiao-Hua, Zhang Dian-Kun, Wang Honggen, Xie Xiqojuan and Chen Chuan-Feng, *Progress in Natural Science*, *2*, 168 (1992).
11. Xie Qing-Lan, Li Jing, Yang Zhi-Qiang, Zhang Dian-Kun and Wang Ji-Tao;. *Chin. J. Chem.*, 9,327 (1991).
12. A.S. Lewis P.J. Smith, J.H. Aupers and D.C. Povey; *J. Organomet. Chem.*, **402**, 319 (1991).
13. Xie Qing-Lan and Zheng Jian-Yu; *Youji Huaxue* (Chinese), *11*, 82 (1991).
14. A. Badshah, M. Danish, S. Ali, M. Mazhar S Mahmood and. M.I. Chaudhary;. *Synth. React. Inorg. Met. Org. Chem.* **24**, 1155 (1994).
15. M. Danish, S. Ali, A. Badshah, M. Mazhar, H. Masood, A. Malik and G. Kehr; *Synth. React. Inorg. Met-Org. Chem.* **27**, 863 (1997)
16. M. Danish, S. Ali, M. Mazhar and A. Badshah; *Main Group Met.Chem.*, 19,121 (1996)
17. Xie Qing-Lan, Xu Xiao-Hua, Xie Xiao-Juan and Chen Chuan-Feng; *Chem. J. Chin.Univ.* (Chinese) **13**,1268 (1992).
18. Xie Qing-Lan, Lin Sen and ShaYin-Lin; *Chem. J. Chin. Univ.*, **15**, 1477 (1994).
19. Yang Zhi-Qiang, Xie Qing-lan and Zhou Xiu-Zhong; *Chem. J. Chin.Univ.* (Chinese), **16**, 59 (1995).
20. Xie Qing-Lan, Yang Zhi-Qiang and Li- Jing; *Main Group Met. Chem.*,19, 509 (1996).
21. Jiang Li,Yang Zhi-Qiang, Xie Qing-Lan and Shan Shu-Xiang; *Acta Chim.Sin.* **53**,1034 (1995).
22. Yang Zhi Qiang, Xie Qing-Lan, and Zhou Xiu-Zhong; *Acta Chim. Sin*, **53**, 721 (1995).
23. Xie Qing Lan,Sun Li-Juan, Liu Hua, Wang Ru-Ji and Wang Hong-Gen; *Appl. Organomet.Chem.*, **8**, 57 (1994).
24. Sun Li-Juan, Liu Hua and Xie Qing-Lan; *Acta Chim.Sin.*,**52**,921 (1994).
25. A.G. Davis and P.J. Smith, Comprehensive Organometallic Chemistry the Synthesis, Reaction and Structures of Organometallic Compounds vol.2, Pergaman, Oxford (1982). G. Wilkanson, F.G.Stone and E.W.Able
26. G.K. Sandhu and R. Hundal; *J.Organomet. Chem.* **436**, 287 (1992).
27. Wang Ji-Tao; *Youji Hauaxue*, **13**, 289 (1993).
28. H.H. Anderson; *J. Org. Chem.* **22**,147 (1957). A. Kalsoom, M. Mazhar, S. Ali, M.I. Chaudhary and K.C. Molloy; *J. Chem. Soc. Pak.***18**, 320 (1996). A. Kalsoom, M. Mazhar, S. Ali, M.F. Mahon, K.C. Molloy and M.I. Chaudhary; *Appl. Organomet. Chem.*, **11**, 47(1997).
29. G.K. Sandhu, G. Kaur, J. Oleck and A. Lycka; *J. Organomet. Chem.*, **345**, 51 (1988).
30. G.K. Sandhu, G. Kaur, J. Holeck and A. Lyeka; *J. Organomet. Chem.*, **365**, 215 (1989).
31. G. K Sandhu, and G. Kaur; *J. Organomet. Chem.*, **388**, 63 (1990).
32. Liu Hua, Xie Qing-Lan, Wang Ji-Tao and M. Mazhar; *Heteroatom Chem.*, **9**, 299 (1998).
33. Xie Qing-Lan, Wang Ming-De,Chen Li and Shen Pan-Wen; *Acta Chim., Sin.* **46**, 831 (1988).
34. M.A. Choudhary, M. Mazhar; *Synth. React. Inorg. Met-Org. Chem.* (accepted) 2000.
35. Li Jing, Xie Qing-Lan and Liao Ren-An; *Progress in Natural Science*, **4**, 168 (1994).
36. S. Ali, M. Danish and M. Mazhar; *Heteroatom Chem.*, **8**,273 (1997).
37. V. Peruzzo, G. Plazzogna and G. Tagliavini; *J. Organomet. Chem.*, **40**, 121 (1972).
38. G. Plazzogna, V Peuzzo and G. Tagliavini; *J. Organomet. Chem.*, **16**, 500 (1969).
39. S. Weber and E.I. Becker; *J. Org. Chem.*, **27**, 1258 (1962).
40. A.K. Sawyer and H. G. Kuivila; *J. Org. Chem.*, **27**, 610 (1962).
41. D. Alleston, A.G. Davis, M. Ancok and R. F. M. White; *J. Chem. Soc.*, 5469 (1963).
42. C. Vatsa, V.K. Jain, T. Kesavadas and E.R.T. Tiekink; *J. Organomet. Chem.*, **410**, 135 (1991).
43. H.H. Anderson; *Inorg. Chem.*, **3**, 912 (1964)
44. A. Davis, L. Smith and P.J. Smith; *J. Orgmanet. Chem.*, **39**, 279 (1972).
45. B.F.E. Ford B.V. Liengme and J.R. Sams; *J. Organomet. Chem.*, **19**, 53 (1969).
46. B. Delmond, J.C. Pommier and J. Valade; *J. Organomet. Chem.*, **47**, 337 (1973).

47. Y. Oddic and M. Pereyre; *J. Organomet. Chem.*, **55**, 273 (1973).
48. B.M. Trost and E. Keinan; *Teterahedron Lett.*,**21**, 2591 (1980)
49. A.G. Davis and W.R. Syme; *J. Chem. Soc.*, 1009 (1969).
50. A.J. Bloodworth and A.G. Davis; *J. Chem. Soc.*, 6558 (1965).
51. Xie Qing-Lan,Li Shu-Zheng, Zhang Zhao-Gui and Hu Jin-Min; *Acta Chim.Sin* **49**,723 (1991).
52. Yang Zhi-Qiang, Xie Qing-Lan and Zhou Xiu-Zhong; Chem. *J. Chin. Uni.*, **15**, 1781 (1994).
53. Yang Zhi-Qiang, Jiang Li, Shan Shu-Xiang and Xie Qing-Lan; Chem. *J. Chin. Uni.*, **16**,1883 (1995)
54. Xie Qing-Lan, Sha-Yin-Lin and Yang Zhi-Qiang; *Chem. Res. Chin.Uni.***11**, 105 (1995).
55. Xie Qing-Lan, Sha-Yin-Lin, Yang Zhi-Qiang, Zhang Zhu-Xin and Zhang Dian-Kun; *Appl. Organomet. Chem.*, **6**, 193 (1992).
56. C. Vatsa, V. K. Jain, T. Kesvadas and E. R. T. Tiekink; *J. Organomet. Chem.*, **408**, 157 (1991).
57. G. K. Sandhu, R. Hundal, and E. R.T. Tiekink; *J. Organomet. Chem.*, **430**, 15(1992).
58. C. S. Parulekar, V. K. Jain T. Kesavadas, and E. R.T. Tiekink; *J. Organomet. Chem.* **387**, 163 (1990).
59. C. Vatsa, V. K. Jain T. K. Das, and E. R.T. Tiekink; *J. Organomet. Chem*, **396**, 9(1990).
60. M. Danish, S. Ali, M. Mazhar, A. Badshah, M. I. Chaudhary, H. G. Alt and G. Kehr; *Polyhedron*, **14**,3115 (1995).
61. Xie Qing-Lan, Xu Xiao-Hua and Zhang Dian-Kun; *Acta Chim. Sin.*, **50**, 508(1992)
62. M. Danish, A. Badshah, S. Saqib Ali, M. Mazhar, N. Islam and M.I. Chaudhary; *Iran. J. Chem. & Chem. Eng.* **13**, 1 (1994).
63. M. H. Bhatti, S. Ali, H. Masood, M. Mazhar and S.I. Qureshi; *Synth. React. Inorg. Met-Org. Chem.* (accepted) 2000.