

SCOPE AND OBJECTIVE OF THE
PRESENT INVESTIGATION

From the preceding discussions the versatile nature of organotin compounds can be easily visualised. The alkyl or aryl substituted tin compounds have extensive Lewis acid character, forming complexes with a wide variety of mono- and poly-dentate ligands. The estertin compounds can be considered as an interesting class of alkyl substituted compounds. These unique compounds viz, β -carboalkoxy alkyl tin halides have in recent years been synthesized by a comparatively cheap and non-hazardous route by Hutton and his co-workers (260,261,305). This entirely new process for organotin intermediates caused a major break-through in tin chemistry for PVC stabilizers. Subsequent work from AKzo chemie Ltd (303) has established their applications as excellent PVC stabilizers with relatively low mammalian toxicities. Although di- and tri-organotin compounds have many applications in industry, the tetra- and mono-organotin derivatives have not yet found extensive commercial utilisation. The generally low mammalian toxicity of the organotin compounds makes them particularly attractive candidates for study. As with the tri- and di-organotin compounds, the monoorganotins have been found to be potential for a diversity of applications. Some of their uses, such as water repellents for fabrics and building materials

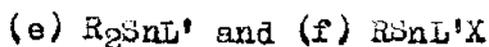
and mineral flotation agents, depend on their hydrophobicity; others involve their ability to act as PVC stabilizer synergists, while a third group of applications involve their use as industrial esterification catalysts.

Estertins, the new generation of organotin stabilizers evoked considerable interest in different areas. But the Lewis acidity of these compounds have not been investigated on extensive scale, particularly with bidentate ligands which can give rise to examples of inner metallic type ^{of complexes}. Moreover Poller (228) has suggested that the efficiency of a PVC stabilizer can be improved on reducing the Lewis acidity of the resulting organotin chloride. The dialkyl tin dichloride formed from the stabilizer (either by absorption of hydrogen chloride or by exchange) is itself a Lewis acid catalyst for further dehydrochlorination. Subsequent tests (59) showed that the ketopentyltin compounds are more than twice as effective in stabilization than the corresponding butyltin derivatives. For example, in the effective stabilizer viz, di (4-ketopentyl) tin di (isooctylthioglycolate) (258, 259) the keto groups would be free but coordinated to tin in the ensuing diorganotin dichloride, thus suppressing the Lewis acidity. In this light the Lewis acid characters of β -carboalkoxy alkyl tin

derivatives would be worth studying. Moreover structural features of these compounds would be of considerable interest. Apart from the evidence for intramolecular co-ordination through their carbonyl functions, both in solid and in solution, there have been very few reports to-date on the acceptor properties of the β -carboalkoxy ethyl tin halides.

Keeping in view of the above considerations, particularly the exciting possibilities of mono- and di-estertins in the field of PVC stabilizers and in other applications, we decided to study the Lewis acidity of estertin compounds viz, β -carboalkoxy ethyl tin halides with a large variety of bidentate ligands. Though the primary objectives of the present investigation were the preparation of β -carboalkoxy alkyl tin co-ordination compounds and their characterisation by elemental analysis and spectral measurements viz, UV/Visible, IR and PMR spectroscopy, a preliminary study of mill heat ($180 \pm 2^\circ\text{C}$) stability and oven heat ($180 \pm 2^\circ\text{C}$) stability of two such complex compounds have been carried out to explore their suitability as PVC stabilizers. The results obtained are quite encouraging and point out the desirability of further studies in this direction. Due to the lack of proper facilities, the suitability of these β -carboalkoxy ethyl tin

coordination complexes as standard PVC stabilizers could not be tested in detail at present. Hence, the investigation was concentrated to the isolation and characterization of a number of such complex compounds. The ligands utilised in the present investigation are 8-hydroxy quinoline (oxine), 5, 7-dichloro oxine, 5-7-dibromo oxine, phenyl-5-azooxine, 5 (2'-carboxy phenyl)azo oxine, 1,5-diphenyl thiocarbazon (Dithizone), 1,5-diphenyl carbazon, Alizarin, Quinalizarin, Sodium alizarin Sulphonate (Alizarin-S), 1-nitroso-2-naphthol etc. With these ligands the following types of co-ordination complexes have been isolated and characterised:



(where $R = CH_3CO_2CH_2CH_2$, $C_4H_9CO_2CH_2CH_2$, $CH_3CO_2CH(CH_3)CH_2$, $CH_3COCH_2C(CH_3)_2$ etc., $L'H = Alizarin$ and $LH =$ other ligands as mentioned above). Most of these are stable and well defined solids.

Some attempts were also made to prepare new (β -carboalkoxy ethyl tin derivatives by replacing the halide ions with thiocyanate, azide, acetate etc. Though we have so far not been able to isolate many compounds

of this type, we could ^{isolate} two new thiocyanate derivatives. Evidences for some other derivatives could be obtained from these studies.

The studies on PVC stabilization and biocidal properties of the complexes prepared so far, are expected to be taken up in near future.