

6.1 CONCLUSION

This project focused on structural studies of the diorganotin complexes, which were prepared from reaction between diorganotin dichlorides and diorganotin oxides with Schiff base ligands. These in term were derived from condensation reaction between an amine/hydrazone with salicylaldehyde, substituted salicylaldehyde, 2-hydroxyacetophenone or substituted 2-hydroxyacetophenone.

The complexes were studied by various spectroscopic methods including infrared (IR), ^1H , ^{13}C , ^{119}Sn NMR and UV spectra. The IR spectra of the ligands and their diorganotin complexes showed the presence of typical functional groups such as C=N and O-H. The ^1H and ^{13}C NMR spectra provided information of the environment of the proton and carbon atoms in the ligands and their diorganotin complexes. On the other hand, ^{119}Sn NMR spectral data provided the information to differentiate five and six-coordination around the tin atom in the diorganotin complexes.

In general, the structural studies of the diorganotin complexes derived from the *tris*(hydroxymethyl)aminomethane and 3-hydroxy-2-naphthoic hydrazide Schiff base ligands by X-ray crystallography showed that the tin atom adopted a trigonal bipyramidal geometry with *-O,N,O-* coordination.

The complex **TB1**, *bis*[(2-{[1,1-*bis*(hydroxymethyl)-2-oxidoethyl]iminomethyl}-4-bromophenolato)]dimethyltin(IV), had a dimeric structure in which a central distannoxane Sn_2O_2 ring involved the coordination of one of the hydroxymethyl oxygen from each of the two adjacent molecules was observed. This was in contrast with the other similar complexes in this series which were found to be

monomeric. In all the complexes, the molecules were linked together by strong intermolecular hydrogen-bonding.

Diorganotin complexes derived from the 3-hydroxy-2-naphthoic hydrazide Schiff base ligands were isostructural with the molecules stabilized by the presence of strong intramolecular N(2) and O(3)-H(3) hydrogen-bonding.

Diorganotin complexes derived from the Schiff base ligands of substituted [2-(3,5-di-*tert*-butyl-4-hydroxybenzyl)sulfanyl]acetatohydrazide were also expected to be five-coordinated although X-ray structure study failed to confirm that due to the poor diffracting crystals.

The cytotoxic activity of the Schiff base ligands and its diorganotin complexes showed that in general, the Schiff base ligands displayed moderate or poor cytotoxic activity as compared to the cytotoxic activity of the diorganotin complexes. The dibutyltin and dicyclohexyltin derivatives displayed a more prominent cytotoxic activity in most of the complex series. Overall, the diorganotin complexes derived from 3-hydroxy-2-naphthoic Schiff base ligands showed the highest cytotoxic activity when compared to the diorganotin complexes from the other series with some complexes having lower IC₅₀ values which were comparable to *cisplatin*.