**ABSTRACT**

The present Ph.D. thesis deals with the synthesis, characterization and screening for biocidal activity of the complexes of organotin(IV) halides with N-heterocyclic ligands, namely imidazo[1,2-\(a\)]pyridines, pyridine derivatives and isoquinoline.

The first chapter incorporates a general review of organotin(IV) complexes of N-heterocyclic ligands including their synthesis, spectral studies and X-ray crystal structure analysis. The literature from 1995 through 2015 has been covered.

In the second chapter, results of the experimental investigation of the complexes of organotin(IV) halide with N-heterocycles have been presented in two sections. In the first section, results of a three component reaction of dimethyltin dibromide with imidazo[1,2-\(a\)]pyridine, pyridine derivatives or isoquinoline and allyl bromide affording ionic complexes, bis(1-allylcycloiminium) dimethyltetabromostannate(II) have been presented. The reaction involves N-allylation of cycloimine accompanied by coordination of two bromide ions with the tin atom of dimethyltin dibromide resulting in the formation of dimethyltetabromostannate(II) anion having octahedral geometry. Structure of a complex was determined by X-ray crystal structure studies. In the second section, synthesis and characterization of 1:2 complexes of organotin(IV) halides with imidazo[1,2-\(a\)]pyridines are described. The structures of the products have been established on the basis of IR and \(^1\)H, \(^{13}\)C, \(^{119}\)Sn NMR studies and X-ray crystal structure analysis. Our results prove unambiguously that in the three component reaction, 1,2-addition of the Sn-Br moiety across C=C bond of the allyl bromide does not take place.
In the third chapter, the results of the synthesis of enamines (acting as a bideterminate ligands) from the Michael addition of secondary amines to DMAD and their subsequent use as bidentate chelating ligands for complexation with organotin(IV) halides affording chelates are presented. The IR and $^1$H NMR and $^{13}$C NMR studies reveal that the enamines coordinate to the tin atom through a carbonyl group and the vinylic carbon atom. Thus it turns out to be a facile method for the formation of the Sn-C bond. $^{119}$Sn NMR studies confirm the Sn atom in the complexes to be hexacoordinated.

The last chapter incorporates the biological activity of against bacterial strains and insecticidal activity of selected organotin(IV) complexes. The antibacterial activity was determined from inhibition zone using disc diffusion method and insecticidal activity results were reported in LC$_{50}$. Most of the selected organotin(IV) complexes were shown to exhibit potential antibacterial activity against four bacterial strains: *Salmonella typhimurium* 98, *Salmonella typhimurium* 100, *Salmonella typhimurium* 102, *Escherichia coli*. They also show insecticidal activity against the store grain insect *Tribolium castaneum*.

The results have been published in the form of the following two publications:
