Asian Journal of Chemistry; Vol. 25, No. 2 (2013), 972-976

ASIAN JOURNAL OF CHEMISTRY

http://dx.doi.org/10.14233/ajchem.2013.13292

Synthesis and Characterization of Organotin(IV) Complexes Derivatives of Methyl- and Nitro-Substituted Monocarboxylic Acid: Preliminary *in vitro* Antibacterial Screening Activity

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(*Received*: 20 December 2011; *Accepted*: 27 August 2012) AJC-12024

Organotin(IV) carboxylate complexes derivatives of 3-methyl-4-nitrobenzoic acid (3-CH_3-4-NO_2-C_6H_3COOH) and 4-methyl-3-nitrobenzoic acid (4-CH_3-3-NO_2-C_6H_3COOH) have been successfully synthesized. Two dibutyltin(IV) complexes with the general formulae {[X-CH_3-Y-NO_2-$C_6H_3COO(C_4H_9)_2Sn]_2O$}$_2$ (X = *meta*, Y = *para* **1**; X = *para*, Y = *meta* **3**) and another two triphenyltin(IV) complexes with the general formulae X-CH_3-Y-NO_2-$C_6H_3COO(C_6H_5)_3Sn{\cdot}CH_3OH$ (X = *meta*, Y = *para* 2; X = *para*, Y = *meta* **4**) were successfully synthesized. The acids and complexes **1-4** obtained were characterized quantitatively and qualitatively. Results of the infrared and NMR spectroscopy on the acids and complexes showed that the coordination took place *via* oxygen atoms from the carboxylate anions. Based on the spectroscopy studies indicated that one methanol molecule also take part in the coordination to tin(IV) atoms moiety in complexes **2** and **4** resulting the tin(IV) atoms exhibited five coordination. From the preliminary *in vitro* antibacterial screening activity, triphenyltin(IV) complexes (**2** and **4**) showed better activity compared to diorganotin(IV) complexes (**1** and **3**).

Key Words: Organotin(IV) complexes, Synthesis, Characterization, *In vitro* antibacterial activity.

INTRODUCTION

Numerous studies on organotin(IV) complexes have been carried out in order to study its biological properties against bacterial, fungal and cancer cells line[1-8]. In fact, organotin(IV) complexes are extensively studied due to its coordination geometries as well as structural diversity (monomer, dimeric, hexameric and oligomeric)[9-13].

In this paper, we report on the synthesis and structural characterization of new organotin(IV) carboxylate complexes derived from 3-methyl-4-nitrobenzoic acid and 4-methyl-3-nitrobenzoic acid. Moreover, the preliminary *in vitro* antibacterial screening activity of the complexes obtained are carried out and the results are reported herein.

EXPERIMENTAL

All the reagents, starting materials as well as the solvents were purchased commercially and used without any further purification. The melting points were determined in an open capillary and were uncorrected. Elemental C, H and N analyses were carried out on a Perkin-Elmer 2400 CHN Elemental Analyzer. Tin was determined gravimetrically by igniting a known quantity of each complex to SnO_2. Infrared spectra were recorded using a Perkin-Elmer System 2000 FTIR spectrophotometer as a KBr disc in the frequency range of 4000-400 cm^{-1}. The spectra for ^1H, ^1H-^{13}C HMQC and ^{119}Sn NMR were recorded on a Bruker AC-P 400 MHz FTNMR spectrometer and ^{13}C NMR was recorded on a Bruker AC-P 300MHz FTNMR spectrometer using deuterated $CDCl_3$ and DMSO-d_6 as the solvent and tetramethylsilane, TMS as the internal standard.

Preliminary *in vitro* antibacterial screening activity: The synthesized complexes and parent acids were screened for their *in vitro* antibacterial activity against three Gram-negative (*Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*) and two Gram-positive (*Bacillus subtilis* and *Staphylococcus aureus*) bacterial strains, by inhibition zone method using agar well diffusion method. The seeded agar (nutrient agar medium) was prepared by cooling the molten agar to 40 ºC and then adding bacterial inoculums containing approximately 10^4-10^6 colony forming units (CFU)/mL. The bacterial inoculums were spread on the plate containing agar medium and even coverage was ensured before the agar solidified. The complexes were dissolved in DMSO to