

SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL STUDIES  
OF ORGANOTIN(IV) COMPLEXES OF THIOSEMICARBAZONE LIGAND  
DERIVED FROM PYRUVIC ACID: X-RAY CRYSTAL STRUCTURE OF  
[Me<sub>2</sub>Sn(PAT)]

(Kajian Sintesis, Pencirian dan Biologi Kompleks Organostannum(IV) bagi Ligan  
Tiosemikarbazon yang Diterbitkan Daripada Asid Piruvik: Struktur Sinar-X Hablur  
[Me<sub>2</sub>Sn(PAT)])

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#### Abstract

Six organotin(IV) complexes of pyruvic acid thiosemicarbazone ligand [H<sub>2</sub>PAT, (1)] with general formula [RSnCl<sub>n-1</sub> PAT] [R = Me<sub>2</sub>, n = 1 (2); R = Bu<sub>2</sub>, n = 1 (3); R = Ph<sub>2</sub>, n = 1 (4); R = Me, n = 2 (5); R = Bu, n = 2 (6); R = Ph, n = 2 (7)] were synthesized by direct reaction of thiosemicarbazone ligand (1), base and organotin(IV) chloride(s) in absolute methanol under N<sub>2</sub> atmosphere. These organotin(IV) complexes were characterized by elemental analyses, molar conductivity, UV-visible, FTIR, <sup>1</sup>H and <sup>13</sup>C NMR spectral studies. Among them, dimethyltin(IV) complex (2) was also characterized by X-ray crystallography diffraction analyses. The cytotoxicity of the ligand (1) as well as its organotin(IV) complexes (2-7) were determined by *Artemia salina*, shrimp test lethality bioassay.

**Keywords:** Thiosemicarbazone, Organotin(IV) complexes, Cytotoxicity

#### Abstrak

Enam kompleks organostannum(IV) bagi ligan piruvik asid tiosemikarbazon [H<sub>2</sub>PAT, (1)] dengan formula am [RSnCl<sub>n-1</sub> PAT] [R = Me<sub>2</sub>, n = 1 (2); R = Bu<sub>2</sub>, n = 1 (3); R = Ph<sub>2</sub>, n = 1 (4); R = Me, n = 2 (5); R = Bu, n = 2 (6); R = Ph, n = 2 (7)] telah disintesis dengan tindak balas terus antara ligan (1), bes dan organostannum(IV) klorida dalam methanol kering di bawah persekitaran N<sub>2</sub> tulen. Kompleks-kompleks organostannum(IV) tersebut telah dicirikan dengan analisis keunsuran, kekonduksian molar, ultraungu cahaya-nampak, inframerah, kajian spektrum Resonan Magnetik Nuklear <sup>1</sup>H dan <sup>13</sup>C. Di antaranya, kompleks dimetilstannum(IV) (2) juga telah dicirikan dengan analisis pembelauan kristalografi sinar-X. Ketoksian ligan (1) dan kompleks-kompleks organostannum(IV)nya (2-7) telah dikaji dengan *Artemia salina*, ujian bioesei kematian anak udang.

**Kata kunci:** Tiosemikarbazon, kompleks organostannum(IV), ketoksian

#### Introduction

Thiosemicarbazones have been extensively investigated. This is largely owing to their structural features and potent biological activity [1]. The biological activity of thiosemicarbazones could be enhanced by the functional groups of the parent aldehyde or ketone [2]. Thiosemicarbazones have been evaluated for their potential antitumour [3], antimalarial, antiviral, radioprotector, anticonvulsant properties, as well as their potential as a trypanocidal agent, ulcer inhibitor and anticancer agent [4].

The metal complexes of thiosemicarbazones, especially thiophene-2-carboxaldehyde thiosemicarbazone with transition metals, such as Pd(II) [5-6], Ru(II) [4], Fe(II) [1], Fe(III) [1], Cu(II) [7-8], Zn(II) and Co(II) [9] has been investigated.

However, less studies reported on thiosemicarbazone complexes with main group elements [10-11]. In view of this, our group decided to embark on a study of the thiosemicarbazone complexes of organotin(IV).