

CHAPTER 1

INTRODUCTION

The main objective of this research was on the synthesis and characterisation of copper(II) cyclam carboxylates (cyclam = 1,4,8,11-tetraazacyclotetradecane, **Figure 1.1**).

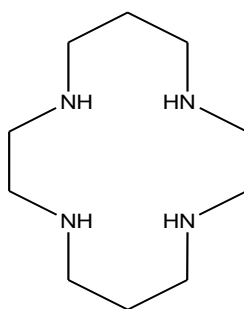


Figure 1.1 The structural formula of cyclam

The carboxylates were aliphatic, $C_nH_{2n+1}COO$ ($n = 6, 7, 9, 11, 13, 15$) and $CH_3(CH_2)_7CH((CH_2)_5CH_3)$, and aromatic, $p-XC_6H_4COO$ ($X = NH_2, OH, OCH_3, CH_3, C\equiv N, H$) and C_6F_5COO . The complexes were expected to be thermally stable, magnetic and possessed liquid crystalline properties (for alkylcarboxylates). The effect of aliphatic chain to the structure and physical properties or the electronic effect of a substituent for arylcarboxylates on the aromatic ring was investigated.

The synthetic methods were facile, and the desired products were obtained in acceptable good yields. Most products are single crystals; hence the structure determination could be deduced directly from X-ray diffraction. Other supporting elucidation includes microelemental analyses and spectroscopic studies (FTIR and UV-Vis).

The effective magnetic moment for selected complexes were investigated using the Gouy method, and the thermal properties of relevant complexes were studied by combination of thermogravimetric analysis (TGA), differential scanning calorimetry (DSC) and optical polarised microscopy (OPM) to observe the mesomorphic textures.

The findings of this research were published or accepted for publication and had been presented in regional and international conference and seminar as listed below.

1. Nur Syamimi Ahmad Tajidi, Norbani Abdullah, Zainudin Arifin, Kong Wai Tan and Seik Weng Ng, *Acta Crystallogr. Sect. E*: (2010) 66, m887.
2. Nur Syamimi Ahmad Tajidi, Norbani Abdullah, Zainudin Arifin, Kong Wai Tan and Seik Weng Ng, *Acta Crystallogr. Sect. E*: (2010) 66, m888.
3. Nur Syamimi Ahmad Tajidi, Norbani Abdullah, Zainudin Arifin, Kong Wai Tan and Seik Weng Ng, *Acta Crystallogr. Sect. E*: (2010) 66, m889.
4. Nur Syamimi Ahmad Tajidi, Norbani Abdullah, Zainudin Arifin, Kong Wai Tan and Seik Weng Ng, *Acta Crystallogr. Sect. E*: (2010) 66, m890.
5. Nur Syamimi Ahmad Tajidi, Norbani Abdullah and Zainudin Arifin, *Acta Crystallogr. Sect. E*: (2011) 67, m588-m589.
6. Norbani Abdullah, Yasameen Al-Hakem, Nazirah Abdullah, Habibah Samsudin, Nur Syamimi Ahmad Tajidi, *Asian J. Chem.* (2014) 26, 987–990.
7. Nur Syamimi Ahmad Tajidi, Norbani Abdullah, Zainudin Arifin, Edward R.T. Tiekink, *Synthesis and characterisation of new copper(II) complexes with 1,4,8,11-tetraazacyclotetradecane and isomeric $C_{15}H_{31}COO^-$ ligands*, 3rd International Conference for Young Chemists 2010 (June 23rd–25th, 2010).
8. Nur Syamimi Ahmad Tajidi, Norbani Abdullah, Zainudin Arifin, Edward R.T. Tiekink, *Synthesis and characterisation of new copper(II) complexes with 1,4,8,11-tetraazacyclotetradecane and isomeric $C_{15}H_{31}COO^-$ ligands*, Mini

Symposium with Prof. Jan Reedjik, Chemistry Department, University of Malaya (24th July, 2010).

9. Nur Syamimi Ahmad Tajidi, Norbani Abdullah and Zainudin Arifin, *Copper(II) carboxylate – cyclam complexes: effects of aromatic and aliphatic carboxylates on the crystal structure, thermal stability and metallomesogenic properties*, 14th Asian Chemical Congress 2011 (Sept 5th – 8th, 2011).

The thesis consists of five chapters. **Chapter 1** presents the introduction of the research, **Chapter 2** covers the background studies and related literature review, including the chemistry of copper(II) carboxylates, cyclam, and brief concepts on theoretical chemistry. **Chapter 3** presents the synthesis and the computational details, and **Chapter 4** presents the results and discussions. Finally, **Chapter 5** concludes the findings and provides suggestions for future works. A list of references is included at the end of each chapter.