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Studies on solubility, nucleation kinetics, growth and characterization of organic crystal - Ammonium picronitrate

Hanumantharao Redrothu¹, S.Kalainathan^{2*}

¹Vignan's Institute of Information technology, Physics division, H&BS,
Visakhapatnam 530049, India

²Crystal Research Center, VIT University, Vellore, Tamilnadu – 632014, India.

*Corres.author: kalainathan@yahoo.com

Abstract: Good quality single crystals of Ammonium picronitrate (APN) were successfully grown by slow evaporation method. Investigation on solubility studies have been made in the temperature range of 30-50 °C in steps of 5 °C. Metastable zone width was determined by employing conventional polythermal method.

Keywords: nucleation kinetics, growth and characterization of organic crystal, Ammonium picronitrate, solubility Studies.

1. Introduction

Amino acid crystals show special features of interest such as molecular chirality and wide transparency in the visible and UV region [1]. In this report, single crystals of organic Ammonium picronitrate (APN) were grown successfully by slow evaporation method at room temperature. The structure elucidation of APN was carried out by single crystal X-ray diffraction studies reported in [2,3]. To our knowledge, no systematic studies of APN have been made and hence in the present investigation we report on synthesis, solubility, Nucleation, growth and characterization for APN single crystals.

2. Experimental

2.1. Material synthesis

Ammonium picronitrate ($C_6H_6N_4O_7$) was synthesized by the reaction between L-glutamic acid and picric acid in the molar ratio 1:1. The process of recrystallization was carried out to purify the synthesized salt. Good crystal of APN is shown in Fig-1.

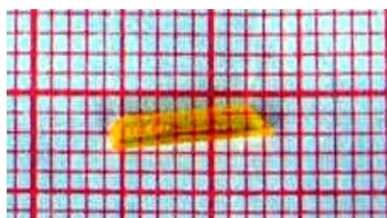


Fig-1: As grown APN crystal

2.2. Solubility and metastable zone width measurements

Solubility studies of APN have been done in the solvents of water and methanol. The solubility was determined for five different temperatures namely 30, 35 40, 45 and 50 °C. The solubility curve is presented in Fig. 2. Metastable zone width measurements have been done from pre determined solubility data. Metastable zone width [Fig. 3.] of APN was measured by conventional polythermal method [3]. In polythermal method, the equilibrium-saturated solution is cooled from the overheated temperature until the first visible crystal is observed.

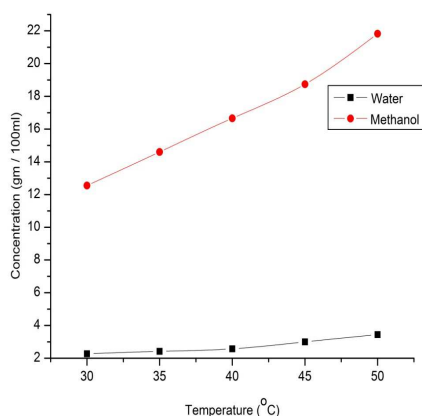


Fig.2. Solubility curve for APN crystal

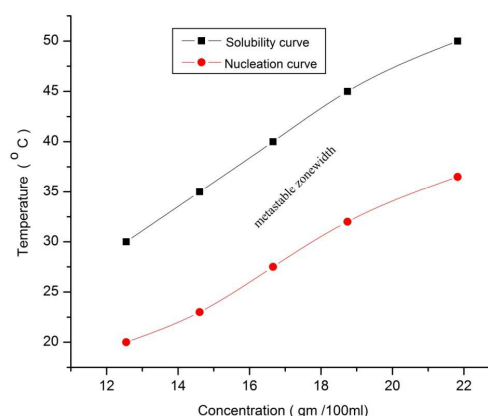


Fig. 3. Metastable zone with for APN crystal

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