

Author's Accepted Manuscript

Thermal properties and optimization of process parameters for the growth of silver thiogallate crystal by differential scanning calorimetry

Zhiyu He, Beijun Zhao, Shifu Zhu, Baojun Chen, Wei Huang



www.elsevier.com/locate/jcrysgr

PII: S0022-0248(14)00332-7
DOI: <http://dx.doi.org/10.1016/j.jcrysgr.2014.04.032>
Reference: CRY22239

To appear in: *Journal of Crystal Growth*

Received date: 12 February 2014

Revised date: 12 April 2014

Accepted date: 30 April 2014

Cite this article as: Zhiyu He, Beijun Zhao, Shifu Zhu, Baojun Chen, Wei Huang, Thermal properties and optimization of process parameters for the growth of silver thiogallate crystal by differential scanning calorimetry, *Journal of Crystal Growth*, <http://dx.doi.org/10.1016/j.jcrysgr.2014.04.032>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Thermal properties and optimization of process parameters for the growth of silver thiogallate crystal by differential scanning calorimetry

Zhiyu He, Beijun Zhao*, Shifu Zhu, Baojun Chen, Wei Huang

Department of Materials Science, Sichuan University, Chengdu 610064, People's Republic of China

Abstract: In present work, thermal properties of silver thiogallate (AgGaS₂) crystal were investigated by means of differential scanning calorimetry (DSC) measurements performed at different heating and cooling rates. The DSC results confirmed that the melting point was 1249 K with a slight change around 5 K and that the nucleation temperature varied from 1183 K to 1218 K. The supercooling temperature was evaluated in the range 37.69 K to 62.46 K which was considered to be harmful for the single nucleus formation at the beginning of crystal growth. The activation energy E and the pre-exponential factor A were also calculated using different isoconversional methods, namely Kissinger-Akahira-Sunose (KAS) method and Flynn-Wall-Ozawa (FWO) method, and the results showed good agreement with each other. According to the results of DSC, a larger temperature gradient up to 30K/cm was utilized to suppress the formation and growth of multi nuclei and a rapid cooling rate 25 K/min was applied to minimize the second-phase precipitates during the process of crystal growth. Finally, an integral and transparent AgGaS₂ single crystal with diameter of 22 mm and the length of 55 mm was obtained.

PACS: 42.70.Nq; 65.60.+a; 81.70.Pg; 81.10.-h

Keywords: B1. AgGaS₂; A1. thermal properties; A1. differential scanning calorimetry; A2. crystal growth;

1. Introduction

The ternary semiconductors with the general formula $A^I B^{III} C_2^{VI}$ are widely studied due to their promising potential applications [1-3]. Among these compounds, silver thiogallate (AgGaS₂) is known for a long time for its outstanding nonlinear optical properties. It has large nonlinear optical (NLO) coefficient ($d_{36} = 18$ pm/V), sufficient birefringence ($n_e - n_o \approx 0.05$), wide IR

*Corresponding author. Tel./ Fax: +86 28 85412745.
E-mail address: bjzhao@scu.edu.cn

Download English Version:

<https://daneshyari.com/en/article/8150960>

Download Persian Version:

<https://daneshyari.com/article/8150960>

[Daneshyari.com](https://daneshyari.com)