Study of high reslution measurement of thin-film-thermal-properties by the ultra-high sensitive PAS

メタデータ	言語: jpn 出版者: 公開日: 2022-06-16 キーワード (Ja): キーワード (En): 作成者: Hata, Tomonobu メールアドレス: 所属:
URL	https://doi.org/10.24517/00066390

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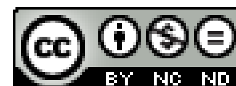

1996 Fiscal Year Final Research Report Summary

Study of high reslution measurement of thin-film-thermal-properties by the ultra-high sensitive PAS

Research Project

Project/Area Number

06452139

Research Category

Grant-in-Aid for Scientific Research (B)

Allocation Type

Single-year Grants

Section

一般

Research Field

Applied physics, general

Research Institution

Kanazawa University

Principal Investigator

HATA Tomonobu Kanazawa University, Faculty of Engineering, Professor, 工学部, 教授 (50019767)

Co-Investigator(Kenkyū-buntansha)

SASAKI Kimihiro Kanazawa University, Faculty of Engineering, Associate Professor, 工学部, 助教授 (40162359)

Project Period (FY)

1994 – 1996

Keywords

PAS / Thermal Conductivity / Si / Photothermal Spectroscopy / Thermal Diffusivity / InP

Research Abstract

Original point of our research is to evaluate thermal diffusivity of thin films deposited on the substrate. In the conventional PAS technique as the thermal diffusion length is much larger than the film thickness, it is impossible to evaluate the thermal property for the only films on the substrate. We proposed that the lateral thermal diffusion induced by the optical absorption can be detected by the tiny pyroelectric sensor.
At first, we evaluated various bulk samples by the dimensional thermal propagation by the z-cut LiNbO3 pyroelectric element and found that those thermal diffusivities are Si : 0.87, Cu : 0.96, InP : 0.44, GaAs : 0.25, Ta : 0.24 [cm2/s]. Those values are within 5% difference compared with handbook data.
Next, we evaluated a-1 mu m-thick Si thin film deposited on the quartz substrate. We assumed that when laser beam is irradiated on the film thermal resistance is assumed a parallel connection with the resistance of film and that of substrate. It is easy to separate those two resistances experimentally. Thus, We established how to measure the thermal diffusivity and found that the value for quartz substrate is 7.18*10^3 [cm^2/s] and that for Si thin film is 0.65 [cm^2/s].

Research Products (1 results)

All **Other**

All **Publications (1 results)**

[Publications] T.Hata, H.Konishi, D.Iwai, K.Sasaki: "Evaluation of Optical Absorption Coefficient of Si by Photothermal Spectroscopy Using Transparent Pyroelectric Transducer" Jpn.J.Appl.Phys.Vol.34. 2911-2916 (1995)

URL: https://kaken.nii.ac.jp/report/KAKENHI-PROJECT-06452139/064521391996kenkyu_seika_hokoku_

Published: 1999-03-08