

Study on a new method of X-ray stress measurement using two dimensional X-ray detector

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1997 Fiscal Year Final Research Report Summary

Study on a new method of X-ray stress measurement using two dimensional X-ray detector

Research Project

Project/Area Number

08650099

Research Category

Grant-in-Aid for Scientific Research (C)

Allocation Type

Single-year Grants

Section

一般

Research Field

Materials/Mechanics of materials

Research Institution

Kanazawa University

Principal Investigator

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Project Period (FY)

1996 - 1997

Keywords

X-ray stress measurement / Residual stress / non-destructive inspection / Experimental Mechanics / Stress / Imaging plate / Elastic constants / X-ray diffraction

Research Abstract

This study was performed to examine the possibility of the X-ray stress measurement by analyzing whole Debye-Scherrer ring. An imaging plate (IP) was used for the detection of X-ray in order to obtain a high degree of accuracy and efficiency. Through the investigation on the Tanaka's method, we proposed new equations for σ_y and τ_{xy} . We also found that the Tanaka's method involved an assumption that the angle η was constant. So we proposed a new method for the determination of stresses from Debye-Scherrer ring without the above approximation on angle η . For the experiment, a new system of processing image data, calculating stresses and back-reflection Laue camera for IP with a four-point-bending-device was manufactured. The

stress applied mechanically with this device was compared to that from the present method. The result showed that it was possible to obtain the stress with the same accuracy as that by the $\sin^2\psi$ method. The advantage of this method is that one can obtain all three components of the stress in plane stress state from one diffraction ring with single incidence of X-ray beam.

Research Products (6 results)

All Other

All Publications (6 results)

[Publications] 佐々木 敏彦: "イメージングプレートを用いたマクロ・ミクロ応力のX線測定および $(\alpha+\gamma)$ 二相ステンレス鋼への応用" 日本機械学会論文集A編. 62巻604号. 2741-2749 (1996) ▼

[Publications] 佐々木 敏彦: "イメージングプレートを用いた粗大結晶粒材料のX線マクロ応力測定" 日本機械学会論文集A編. 63巻607号. 533-541 (1997) ▼

[Publications] 佐々木 敏彦: "イメージングプレートを用いたX線残留応力のコンピュータトモグラフィ" 日本機械学会論文集A編. 63巻614号. 2196-2204 (1997) ▼

[Publications] Toshihiko Sasaki: "X-ray Stress Measurement of Coarse-Grained Polycrystalline Materials by Imaging Plate Method" Bull.of.JSME (A). 62-64. 2741-4749 (1996) ▼

[Publications] Toshihiko Sasaki: "Application of Computerized Tomography to Residual Stress Obtained by X-ray Diffraction Method Using Imaging Plate" Bull.of.JSME (A). 63-607. 533-541 (1997) ▼

[Publications] Toshihiko Sasaki: "X-ray Measurement of Macro-and Microstresses Using Imaging Plate and Its Application to Ferritic and Austenitic Dualphase Stainless Steel" Bull.of.JSME (A). 63-614. 2196-2204 (1997) ▼

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