

RESIDUAL STRESS ESTIMATION OF TI CASTING ALLOY BY X-RAY SINGLE CRYSTAL MEASUREMENT METHOD

Ayumi Shiro¹, Takao Hanabusa², Masayuki Nishida³ and Tian Jing⁴

¹Graduate Student, The University of Tokushima, Tokushima, Japan

²The University of Tokushima, Tokushima, Japan

³Kobe City College of Technology, Kobe, Hyogo, Japan

⁴Harbin Institute of Technology, Harbin, China

Recently, titanium casting technology attracts attention in the industrial fields. These casting metals are including a various residual stresses due to the heat shrinkage and inclusion particles, et al. In order to apply the casting technology, the accurate estimation of residual stresses is desired in many cases. In this study, it aims at the nondestructive stress evaluation of titanium casting material by the X-ray stress measurement technique. Moreover, the measuring sample is the cylindrically-shaped of Ti-6Al-4V alloy manufactured by vacuum casting method in Harbin Institute of Technology. As the first trial in this study, the $\sin^2 \psi$ method for the usual X-ray stress measurement was investigated to measure the residual stresses. However, it was unsuitable for measurement of titanium casting material because of including coarse grains. Therefore, another X-ray method for single crystal system was employed to coarse crystal grains, in order to investigate the possibilities of residual stress estimating. Four-axes sample table which can set the both of tilt angle ψ and rotate one kai on the sample surface was prepared for experimental measurement. The stereographic diagrams and the theory of elasticity were used to measure the single crystal stresses on the sample surface. From measurement results, it is possible to apply X-ray stress measurement method for single crystal system to the residual stresses in this sample. The coarse crystal grains can be taken as single crystals. Furthermore, results of residual stress distribution in center and edge position are tensile stress. The other hand, residual stresses in middle position between center and edge is compression stress state.

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2. I agree with posting abstract on the DXC web site.

3. Speaker's detail

Speaker's name: Ayumi Shiro

Mailing address: The University of Tokushima, 2-1 Minamijosanjima-chou,
Tokushima, Tokushima, 770-8506 Japan

Phone number: +81-(0)88-656-7377

Fax number: nothing

E-mail address: sweetfish1746@gmail.com

4. My prepare is as followed;

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Laboratory X-ray technique.

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