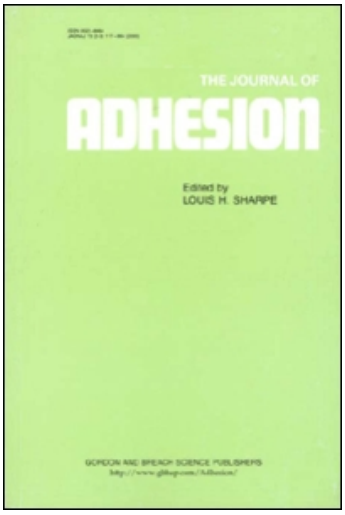

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Contents

Dynamic Analysis of Adhesively Bonded Structures (Dynamic Response and Modal Analysis for Adhesively Bonded Beams)

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Abstract

It is well known that adhesively bonded structures are effective on controlling flexural vibrations over a wide frequency range due to viscoelastic characteristics of an adhesives layer. This paper describes a preliminary theoretical investigation for a finite element modeling of adhesively bonded beams in consideration of the inertia effect of the adhesive layer. The viscoelastic properties of adhesive were expressed by a simple Voigt model. A free vibration test was conducted by using the bonded beam made of two aluminum strips as the adherends and butadiene-styrene copolymer rubber (SBR) as the adhesive layer. The time-deformation history at the free end of the beam was compared with the calculated result. The comparison shows that the present analytical program was effective to predict the vibration characteristics of the adhesively bonded structures in a certain frequency range. The modal analysis using simultaneous basic equations of motion derived from the present finite element modeling was also conducted.

The followings are given from the analytical results:

- The damping factor of the structure increases with increase of the damping coefficient of the Voigt model of the adhesive. However, the damping coefficient has less effect on the natural frequencies of the adhesively bonded structure.
- As the adhesive layer becomes thin, the damping factor of the structure increases.

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Stress Analysis of the Adhesive Joint under Torsional Load (The Case of Butt Joint of Two Solid Shafts)

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Abstract

In this paper, the stress distribution and the displacement of a butt adhesive joint subjected to a torsional load, in which two dissimilar solid shafts are joined, are analyzed using three dimensional theory of elasticity.

In the case of a band-adhesive joint of similar solid shafts, effects of the ratio of

shearing modulus of an adhesive layer to that of adherends and the joined position of band-adhesive on the stress distribution and the displacement are examined by the numerical analyses.

Results obtained are as follows.

(1) With an increase of the ratio of shearing modulus of an adhesive layer to that of adherends, the singularity of the stress becomes large at the inner and the outer boundary of joined faces of the adherends.
(2) The torsional strength of the band-adhesive joint which is joined at the outer end faces of the adherends is larger than that joined at the inner end faces.
(3) The maximum shear stress of the adhesive layer which is joined at the outer end faces of the adherends increases by 30% comparing with a joint of which end faces are completely in adhesion.

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Simple Strength Prediction Methods of Adhesive Joints

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Abstract

This paper is concerned with a simple strength prediction method of single lap joints and double strap joints. The method to predict the strength of various size joints using some experimental data of a certain size joint is shown. In the case of single lap joints, the strength prediction method using J-integral is proposed. In the case of double strap joints, the strength prediction method using strain and stress gradient is proposed. The predicted strengths of single lap joints and double strap joints agree with the experimental ones of various size joints.

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