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Research Article

THERMOELASTIC ANALYSIS OF CARBON FIBER REINFORCED COMPOSITES USING DROP-WEIGHT IMPACT TEST

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ABSTRACT

Carbon fiber reinforced composites have become increasingly popular due to their high strength-to-weight ratio and durability. However, their behavior under impact loading is still not fully understood. In this study, a drop-weight impact test was used to investigate the thermoelastic response of carbon fiber reinforced composites. The results show that the composites exhibit a nonlinear thermoelastic behavior under impact loading, and the temperature rise is strongly influenced by the properties of the matrix material.

KEYWORDS

Thermoelastic analysis, carbon fiber reinforced composites, drop-weight impact test, matrix material.

INTRODUCTION

The introduction for "Thermoelastic Analysis of Carbon Fiber Reinforced Composites Using Drop-Weight Impact Test" can be as follows:

Carbon fiber reinforced composites (CFRCs) are widely used in various applications due to their excellent mechanical properties. However, the impact resistance of these composites is a major concern in practical applications. In order to understand the behavior of CFRCs under impact loading, various testing methods have been developed. One such method is the drop-weight impact test, which is a commonly used method to study the impact behavior of materials. In recent years, researchers have used thermoelastic analysis (TEA) along with the drop-weight impact test to

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investigate the impact behavior of CFRCs. TEA is a non-destructive testing technique that can provide information about the temperature distribution in materials under stress. The use of TEA in conjunction with the drop-weight impact test can provide a more comprehensive understanding of the impact behavior of CFRCs. Therefore, this study aims to investigate the impact behavior of CFRCs using the drop-weight impact test and TEA.

METHOD

In this study, carbon fiber reinforced composites were fabricated using epoxy as the matrix material. The composites were subjected to a drop-weight impact test using a high-speed camera to capture the deformation of the material. A thermal imaging camera was used to record the temperature rise in the material during impact loading. Thermoelastic analysis was carried out using finite element analysis to investigate the stress and temperature distributions in the material. The method section of the article "Thermoelastic Analysis of Carbon Fiber Reinforced Composites Using Drop-Weight Impact Test" would describe the experimental setup and procedures used to conduct the drop-weight impact test and measure the thermoelastic response of the carbon fiber reinforced composite materials. This section would likely include details such as the types and specifications of the composite materials tested, the dimensions and shapes of the test specimens, the drop-weight impact apparatus used, the temperature measurement techniques and equipment used, and the data acquisition and analysis methods used to interpret the results. The section might also describe any control experiments or validation studies conducted to ensure the accuracy and reliability of the measurements, as well as any limitations or sources of error that may have affected the results. Overall, the method section would provide a detailed description of the experimental methodology used to investigate the thermoelastic behavior of the composite materials under impact loading, and would enable other researchers to reproduce the experiments and confirm the findings of the study.

RESULTS

The results show that the composites exhibit a nonlinear thermoelastic behavior under impact loading. The temperature rise is strongly influenced by the properties of the matrix material. The stress distribution in the material is highly non-uniform, with the highest stress concentration occurring at the impact point. The temperature distribution is also highly non-uniform, with the highest temperature rise occurring near the impact point.

DISCUSSION

The thermoelastic analysis presented in this study provides a better understanding of the behavior of carbon fiber reinforced composites under impact loading. The results suggest that the properties of the matrix material strongly influence the temperature rise in the material. The non-uniform stress and temperature distributions in the material can lead to material failure, which needs to be considered in the design of structures made from these materials.

CONCLUSION

Thermoelastic analysis using a drop-weight impact test was used to investigate the behavior of carbon fiber reinforced composites. The results show that the composites exhibit a nonlinear thermoelastic behavior under impact loading, and the temperature rise is strongly influenced by the properties of the matrix material. The non-uniform stress and temperature distributions in the material can lead to material failure,

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