

# Stress Wave Propagation Effects in Two- and Three-layered Composite Materials

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(Received March 4, 2003)

(Revised September 9, 2003)

**ABSTRACT:** Multilayer materials consisting of ceramic and glass/epoxy composites have been subjected to high strain rate compression testing using the Split Hopkinson Pressure Bar. The samples were extensively strain gaged so that dynamic data were generated directly from the samples during testing. Output data from the experiments were compared with numerical simulations of the same experiments and good agreement was noted. It was found that the stress distribution within samples was quite inhomogeneous and that stresses were highest in the region of the bar-sample interface. The presence of a rubber interlayer between the ceramic and glass/epoxy decreased the stress in both components but dramatically increased the degree of stress inhomogeneity.

**KEY WORDS:** multilayer structures, finite element analysis, mechanical properties, high strain rate.

## INTRODUCTION

**M**ECHANICAL TESTING OF conventional metallic materials at high strain rates is a relatively mature technical undertaking. Typical equipment includes the Split Hopkinson Pressure Bar (SHPB), flyer plate tests, and so forth. However, an increasing number of newer materials are being considered for applications where high strain rates are encountered and testing of these is more problematical. For example, many polymers

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# Stress Wave Propagation In Materials

**Mr. Keshavaraj Girinivas, Dr. Shankar  
H. Sanni**



## **Stress Wave Propagation In Materials:**

**International Symposium on Stress Wave Propagation in Materials** Norman Davids,1960      **Stress Wave Propagation in Materials** Norman Davids,1960      STRESS WAVE PROPAGATION IN MATERIALS- PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM. ,      *Foundations of Stress Waves* Lili Wang,2011-08-26 The primary objective of *Foundations of Stress Waves* is to give the reader an understanding of stress wave behaviour while taking into account the dynamic constitutive equations of elastic plastic solids The author has combined a materials characteristics approach with a singularity surface approach in this work which readers will find to be a novel and unique route to solving their problems Helps engineers understand the effects and behavior of stress waves in various materials Aids in the process of engineering design testing and evaluation      *University Park, 1959. International Symposium on Stress Wave Propagation in Materials. (Proceedings.) Edited by Norman Davids, Etc* Norman DAVIDS,1960      **Stress Wave Propagation in Materials/Pennsylvania State University, June 30-July 2, 1959** United States. Office of Ordnance Research,Pennsylvania State University. College of Engineering,1960      **Stress Wave Propagation in Materials** Norman Davids,1960

**International Symposium on Stress Wave Propagation in Materials** International Symposium on Stress Wave Propagation in Materials, Penn. State Univ., 1959,1960      *International Symposium on Stress Wave Propagation in Materials* ,1960      **Stress Wave Propagation in Strain Softening Materials** Michael Ioannis Sotirakos,1994

**International Symposium on Stress Wave Propagation in Materials, Held at the Pennsylvania State University on June 30, July 1 and 2, 1959** ,1960      **International Symposium on Stress Wave Propagation in Materials** Norman Davids,1960      **INTERNATIONAL SYMPOSIUM ON STRESS WAVE PROPAGATION IN MATERIALS, UNIVERSITY PARK, PENNSYLVANIA, 06/30/1959 - 07/02/59** NORMAN ED. DAVIDS,1960      Steady state stress wave propagation in fiber-reinforced elastic materials Stephen Edward Martin,TEXAS UNIV AUSTIN ENGINEERING MECHANICS RESEARCH LAB.,1970 The Bedford Stern theory of composites is used to predict the phase velocity of plane stress waves in a fiber reinforced elastic solid The phase velocity is found as a function of the wave number and as a function of the direction of propagation of the wave relative to the fiber direction The particle motion of each of the constituents is solved for at various wave numbers It is found that there are four possible propagation velocities in a binary mixture of this type and that two of these waves correspond to nearly shear motion while the remaining two correspond to nearly compressional motion Several interesting and unexpected phenomena were found to occur at certain frequencies Author PL      *Numerical Studies on the Stress-wave Propagation in Solid and Foam Materials* Zhen Zheng,2010      **Stress Wave Propagation in Solids** Richard J. Wasley,1973      **Scientific and Technical Aerospace Reports** ,1987 Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database      **Mechanics of Materials Laboratory Course** Ghatu Subhash,Shannon

Ridgeway,2022-05-31 This book is designed to provide lecture notes theory and experimental design of major concepts typically taught in most Mechanics of Materials courses in a sophomore or junior level Mechanical or Civil Engineering curriculum Several essential concepts that engineers encounter in practice such as statistical data treatment uncertainty analysis and Monte Carlo simulations are incorporated into the experiments where applicable and will become integral to each laboratory assignment Use of common strain stress measurement techniques such as strain gages are emphasized Application of basic electrical circuits such as Wheatstone bridge for strain measurement and use of load cells accelerometers etc are employed in experiments Stress analysis under commonly applied loads such as axial loading compression and tension shear loading flexural loading cantilever and four point bending impact loading adhesive strength creep etc are covered LabVIEW software with relevant data acquisition DAQ system is used for all experiments Two final projects each spanning 2 3 weeks are included i flexural loading with stress intensity factor determination and ii dynamic stress wave propagation in a slender rod and determination of the stress strain curves at high strain rates The book provides theoretical concepts that are pertinent to each laboratory experiment and prelab assignment that a student should complete to prepare for the laboratory Instructions for securing off the shelf components to design each experiment and their assembly with figures are provided Calibration procedure is emphasized whenever students assemble components or design experiments Detailed instructions for conducting experiments and table format for data gathering are provided Each lab assignment has a set of questions to be answered upon completion of experiment and data analysis Lecture notes provide detailed instructions on how to use LabVIEW software for data gathering during the experiment and conduct data analysis

**Strength Of Materials** Mr. Keshavaraj Girinivas,Dr. Shankar H. Sanni,2024-07-27 Strength of Materials is a foundational the behavior of solid objects under various types of loading such as tension compression bending and torsion It provides comprehensive coverage of core principles including stress strain and material properties with practical applications in engineering and design The book integrates theory with problem solving techniques making it an essential guide for engineering students and professionals who need to understand material strength to predict failure points and ensure structural integrity Through detailed examples and explanations it bridges theoretical knowledge and real world engineering applications

*Stress Waves in Non-Elastic Solids* W. K. Nowacki,2018-03-06 Stress Waves in Non Elastic Solids is a comprehensive presentation of the principles underlying the propagation of stress waves in non elastic solids with emphasis on wave problems in the theory of plasticity This book exposes wave propagation problems for a range of material responses and justifies the hypotheses introduced in specialized theories and the simplifications made in the analysis of particular problems Both analytical and numerical methods of solving problems are described and a large number of solutions to specific problems of wave propagation in inelastic solids are given This book is comprised of six chapters and begins with an overview of the fundamental equations of the dynamics of inelastic media The dynamical properties of metals

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## Unveiling the Magic of Words: A Overview of "**Stress Wave Propagation In Materials**"

In a global defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their ability to kindle emotions, provoke contemplation, and ignite transformative change is really awe-inspiring. Enter the realm of "**Stress Wave Propagation In Materials**," a mesmerizing literary masterpiece penned with a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve in to the book is central themes, examine its distinctive writing style, and assess its profound effect on the souls of its readers.

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