

Stanford



Fu-Kuo Chang

Professor of Aeronautics and Astronautics

CONTACT INFORMATION

- **Administrator**

Barbara Briscoe - Administrative Associate

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Bio

BIO

Professor Chang's primary research interest is in the areas of multi-functional materials and intelligent structures with particular emphases on structural health monitoring, intelligent self-sensing diagnostics, and multifunctional energy storage composites for transportation vehicles as well as safety-critical assets and medical devices. His specialties include embedded sensors and stretchable sensor networks with built-in self-diagnostics, integrated diagnostics and prognostics, damage tolerance and failure analysis for composite materials, and advanced multi-physics computational methods for multi-functional structures. Most of his work involves system integration and multi-disciplinary engineering in structural mechanics, electrical engineering, signal processing, and multi-scale fabrication of materials. His recent research topics include: Multifunctional energy storage composites, Integrated health management for aircraft structures, bio-inspired intelligent sensory materials for fly-by-feel autonomous vehicles, active sensing diagnostics for composite structures, self-diagnostics for high-temperature materials, etc.

ACADEMIC APPOINTMENTS

- Professor, Aeronautics and Astronautics
- Member, Bio-X

HONORS AND AWARDS

- Life-Time Achievement Award, Society of Prognostic Health Management (2018)
- Life-Time Achievement Award, SPIE NDE/SHM (2010)
- Best Paper Award, 7th International National Workshop on Structural Health Monitoring (2009)
- Best Paper Award, 3rd European Workshop on Structural Health Monitoring (2006)
- Structural Health Monitoring (SHM) Lifetime Achievement Award, The Boeing Company (2004)
- Presidential Young Investigator Award, National Science Foundation (1988)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Editor-in-Chief, Int. J. of Structural Health Monitoring (2012 - present)
- Fellow, American Institute of Aeronautics and Astronautics (2013 - present)
- Fellow, American Society of Mechanical Engineers (2013 - present)

PROFESSIONAL EDUCATION

- PhD, Michigan (1983)

LINKS

- <http://structure.stanford.edu/people/chang.html>: <http://structure.stanford.edu/people/chang.html>

Teaching

COURSES

2020-21

- Analysis of Structures: AA 240 (Aut)
- Mechanics of Composites: AA 256 (Win)
- Structural Health Monitoring: AA 257 (Spr)

2019-20

- Analysis of Structures: AA 240 (Aut)
- Design of Multifunctional Composites: AA 257 (Spr)
- Mechanics of Composites: AA 256 (Win)

2018-19

- Analysis of Structures: AA 240 (Aut)
- Design of Multifunctional Composites: AA 257 (Spr)
- Mechanics of Composite Materials: AA 156 (Win)

2017-18

- Analysis of Structures: AA 240A (Aut)
- Design of Multifunctional Composite Structures: AA 257 (Spr)
- Mechanics of Composites: AA 256 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Ruiqi Chen, Gift Nyikayaramba

Postdoctoral Faculty Sponsor

Mohammad Faisal Haider, Amir Nasrollahi

Doctoral Dissertation Advisor (AC)

Anthony Bombik, Xiyuan Chen, Sara Ha, Cheng Liu, Elliot Ransom, Tanay Topac

Master's Program Advisor

Ethan Clemmitt, Frank Kozel, Roshan Nair, Akshay Nalla, Jeff Nolte, Asta Wu

Publications

PUBLICATIONS

- **Bio-inspired stretchable network-based intelligent composites** *JOURNAL OF COMPOSITE MATERIALS*
Salowitz, N., Guo, Z., Li, Y., Kim, K., Lanzara, G., Chang, F.

2013; 47 (1): 97-105

- **Sensor Network Configuration Effect on Detection Sensitivity of an Acousto-Ultrasound-based Active SHM System**
Janapati, V., Kopsaftopoulos, F., Roy, S., Mueller, I., Lee, S., J., Ladpli, P., Chang, F.
2013
- **Development of High Performance BS-PT Based Piezoelectric Transducer for Structural Health Monitoring of High-Temperature Polymer-Matrix Composite Structures**
Li, Y. -H., Kim, S. -J., Nardari, R., Oropeza, D., Chang, F. -K
2013
- **Screen Printed Piezoceramic Actuators/Sensors Microfabricated on Organic Films and Stretchable Networks**
Salowitz, N., Guo, Z., Kim, S. -J., Li, Y. -H, Lanzara, G., Chang, F. -K
2013
- **Monitoring Transverse Matrix Cracking in Composite Laminates Using Ultrasonic Guided Waves**
Larrosa, C., Chang, F. -K
2013
- **Structural damage detection using ultrasonic guided waves under varying ambient temperature and loading environments**
Roy, S., Ladpli, P., Lonkar, P., Chang, F. -K
2013
- **A vision on stretchable bio-inspired networks for intelligent structures**
Salowitz, N., Guo, Z., Roy, S., Nardari, R., Li, Y. -H, Kopsaftopoulos, F., Chang, F.
2013
- **A structural health monitoring fastener for tracking fatigue crack growth in bolted metallic joints** *STRUCTURAL HEALTH MONITORING-AN INTERNATIONAL JOURNAL*
Rakow, A., Chang, F.
2012; 11 (3): 253-267
- **Design of Optimal Layout of Active Sensing Diagnostic Network for Achieving Highest Damage Detection Capability in Structures**
Janapati, V., Lonkar, K., Chang, F., K.
2012
- **Real-time prediction of impact-induced damage for composite structures based on failure analysis and efficient database methods**
Roy, S., Mueller, I., Janapati, V., Das, S., Chang, F. -K
2012
- **A Model-assisted Integrated Diagnostics for Structural Health Monitoring**
Lonkar, K., Janapati, V., Roy, S., Chang, F. -K
2012
- **Bio-inspired intelligent sensing materials for fly-by-feel autonomous vehicles**
Salowitz, N., Guo, Z., Kim, S., J., Li, Y. -H, Lanzara, G., Chang, F. -K
2012
- **Real time in-situ damage classification, quantification and diagnosis for composite structures**
Larrosa, C., Chang, F. -K
2012
- **Strain/Elongation Sensitive Metal-Coated Polyimide Microwires for Micro-Scaled Highly Expandable Sensor Networks**
Lanzara, G., Guo, Z., Salowitz, N., Chang, F. -K
2012
- **Bio-Inspired Smart Skin Based on Expandable Network**
Guo, Z., Kim, K., Lanzara, G., Salowitz, N., Peumans, P., Chang, F. -K
2011
- **Micro-Fabricated, Expandable Temperature Sensor Network for Macro-Scale Deployment in Composite Structures**

- Guo, Z., Kim, K., Lanzara, G., Salowitz, N., Peumans, P., Chang, F. -K
2011
- **Physics Based Temperature Compensation Strategy for Structural Health Monitoring** *8th International Workshop on Structural Health Monitoring*
Roy, S., Lonkar, K., JANAPATI, V., Chang, F.
DESTECH PUBLICATIONS, INC.2011: 1139–1149
 - **A Robust Impact Force Determination Technique for Complex Structures**
Mueller, I., Vonnieda, K., Das, S., Chang, F. -K
2011
 - **Accelerated aging experiments for prognostics of damage growth in composite materials**
Saxena, A., Goebel, K., Larrosa, C., Janapati, V., Roy, S., Chang, F. -K
2011
 - **Development of a bio-inspired stretchable network for intelligent composites**
Salowitz, N., Guo, Z., Li, Y. -H, Kim, K., Lanzara, G., Chen, Y., Chang, F.
2011
 - **On the Performance Quantification of Active Sensing SHM Systems using Model-assisted POD Methods**
Mueller, I., Janapati, V., Banerjee, S., Lonkar, K., Roy, S., Chang, F. -K
2011
 - **Characterization of temperature, load and damage effects using piezo-electric transducer patches based on fuzzy clustering**
Lopes, V., Gonzalez, C., da Silva, S., Roy, S., Kode, K., Sunor, F., Chang, F.
2011
 - **Development of SEM-based PESEA Code for Modeling PZT Induced Acousto-ultrasonic Waves Propagating in Metallic & Composite Structures**
Lonkar, K., Chang, F. -K
2011
 - **High Temperature Intelligent Composites**
Li, Y. -H., Kim, S. -J., Salowitz, N., Roy, S., Larrosa, C., Janapati, V., Chang, F.
2011
 - **Damage classification in composite laminates, matrix micro-cracking and delamination**
Larrosa, C., Lonkar, K., Shankar, S., Chang, F. -K
2011
 - **In-situ damage assessment of composite laminates via active sensor networks**
Larrosa, C., Janapati, V., Roy, S., Chang, F. -K
2011
 - **A Spider-Web-Like Highly Expandable Sensor Network for Multifunctional Materials** *ADVANCED MATERIALS*
Lanzara, G., Salowitz, N., Guo, Z., Chang, F.
2010; 22 (41): 4643-4648
 - **Editorial-2009 Technology Review and Update: Selected Highlights from IWSHM 2009** *STRUCTURAL HEALTH MONITORING-AN INTERNATIONAL JOURNAL*
Chang, F., Guemes, A.
2010; 9 (3): 197-198
 - **Adhesive Layer Effects on PZT-induced Lamb Waves at Elevated Temperatures** *STRUCTURAL HEALTH MONITORING-AN INTERNATIONAL JOURNAL*
Ha, S., Lonkar, K., Mittal, A., Chang, F.
2010; 9 (3): 247-256
 - **Prediction of Progressive Damage State at the Hot Spots using Statistical Estimation** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*
Banerjee, S., Qing, X. P., Beard, S., Chang, F.
2010; 21 (6): 595-605

- **Adhesive interface layer effects in PZT-induced Lamb wave propagation** *SMART MATERIALS AND STRUCTURES*
Ha, S., Chang, F.
2010; 19 (2)
- **Sensor Network Optimization for a Passive Sensing Impact Detection Technique** *STRUCTURAL HEALTH MONITORING-AN INTERNATIONAL JOURNAL*
Markmiller, J. F., Chang, F.
2010; 9 (1): 25-39
- **The Needs for SHM Technology Classification**
Mueller, I., Chang, F. -K
2010
- **A Spider Web-Like Highly Expandable Sensor Network** *Advanced Materials*
Lanzara, G., Salowitz, N., Guo, Z., Chang, F. -K
2010; 41 (22): 44643-4648.
- **An Integrated Health Management System for Real-Time Impact Monitoring and Prediction of Impact-Induced Damage on Composite Structures**
Mueller, I., Das, S., Roy, S., Janapati, V., Vonnieda, K., Zhang, D., Chang, F.
2010
- **Optimizing a spectral element for modeling PZT-induced Lamb wave propagation in thin plates** *SMART MATERIALS & STRUCTURES*
Ha, S., Chang, F.
2010; 19 (1)
- **Design and characterization of a carbon-nanotube-reinforced adhesive coating for piezoelectric ceramic discs** *SMART MATERIALS & STRUCTURES*
Lanzara, G., Chang, F.
2009; 18 (12)
- **Development of a real-time active pipeline integrity detection system** *SMART MATERIALS & STRUCTURES*
Qing, X. P., Beard, S., Shen, S. B., Banerjee, S., Bradley, I., Salama, M. M., Chang, F.
2009; 18 (11)
- **Influence of Interface Degradation on the Performance of Piezoelectric Actuators** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*
Lanzara, G., Yoon, Y., Kim, Y., Chang, F.
2009; 20 (14): 1699-1710
- **Optimal placement of sensors for sub-surface fatigue crack monitoring** *THEORETICAL AND APPLIED FRACTURE MECHANICS*
Teo, Y. H., Chiu, W. K., Chang, F. K., Rajic, N.
2009; 52 (1): 40-49
- **Damage Detection for Composite Laminate Plates with A Distributed Hybrid PZT/FBG Sensor Network** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*
Wu, Z., Qing, X. P., Chang, F.
2009; 20 (9): 1069-1077
- **The effects of structural variations on the health monitoring of composite structures** *International Workshop on Structural Assessment of Composite Structures*
Chiu, W. K., Tian, T., Chang, F. K.
ELSEVIER SCI LTD.2009: 121-40
- **An integrated health management and prognostic technology for composites airframe structures**
Mueller, I., Larrosa, C., Roy, S., Mittal, A., Lonkar, K., Chang, F. -K
2009
- **A robust structural health monitoring technique for airframe structures**
Mueller, I., Chang, F. -K, Roy, S., Mittal, A., Lonkar, K., Larrosa, C.
2009
- **An integrated diagnostic to prognostic SHM technology for structural health management**
Mueller, I., Larrosa, C., Roy, S., Chang, F. -K

2009

- **Model-Based Impact Monitoring by Inverse Methods using Particle Swarm Optimization**
Mueller, I., Chang, F. -K
2009
- **Adhesive Layer Effects on Temperature-sensitive Lamb Waves Induced by Surface-mounted PZT Actuators**
Ha, S., Mittal, A., Lonkar, K., Chang, F. -K
2009
- **SACL Activities in Structural Health Monitoring**
Guo, Z., Mueller, I., Lanzara, G., Janapala, N., Lonkar, K., Mittal, A., Chang, F.
2009
- **Design of Planar Electrodes for Multifunctional Piezoelectric Sensors**
Salowitz, N., Lanzara, G., Guo, Z., Rose, J., Chang, F. -K
2009
- **Multifunctional Sensor Nodes in Stretchable Network for Structural Health Monitoring**
Lanzara, G., Salowitz, N., Guo, Z., Chatterjee, D., Kim, K., Peumans, P., Chang, F.
2009
- **Health monitoring of bonded composite repair in bridge rehabilitation** *SMART MATERIALS AND STRUCTURES*
Wu, Z., Qing, X. P., Ghosh, K., Karbhar, V., Chang, F.
2008; 17 (4)
- **In vitro atherosclerotic plaque characterization by acoustic impedance monitoring, Part I: Sensor modeling, design, and fabrication** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*
Dugnani, R., Chang, F. K.
2008; 19 (7): 815-826
- **Time-domain spectral element method for built-in piezoelectric-actuator-induced lamb wave propagation analysis** *AIAA JOURNAL*
Kim, Y., Ha, S., Chang, F.
2008; 46 (3): 591-600
- **Energy absorption features of 3-D braided rectangular composite under different strain rates compressive loading** *AEROSPACE SCIENCE AND TECHNOLOGY*
Gu, B., Chang, F.
2007; 11 (7-8): 535-545
- **Built-in sensor network for structural health monitoring of composite structure** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*
Qing, X. P., Beard, S. J., Kumar, A., Ooi, T. K., Chang, F.
2007; 18 (1): 39-49
- **Detection of bolt loosening in C-C composite thermal protection panels: I. Diagnostic principle** *SMART MATERIALS AND STRUCTURES*
Yang, J. Y., Chang, F. K.
2006; 15 (2): 581-590
- **Detection of bolt loosening in C-C composite thermal protection panels: II. Experimental verification** *SMART MATERIALS AND STRUCTURES*
Yang, J. K., Chang, F. K.
2006; 15 (2): 591-599
- **Debond detection using embedded piezoelectric elements in reinforced concrete structures - Part I: Experiment** *STRUCTURAL HEALTH MONITORING-AN INTERNATIONAL JOURNAL*
Wu, F., Chang, F. K.
2006; 5 (1): 5-15
- **A hybrid piezoelectric/fiber optic diagnostic system for structural health monitoring** *1st International Conference on Structural Health Monitoring and Intelligent Infrastructure*
Qing, X. L., Kumar, A., Zhang, C., Gonzalez, I. F., Guo, G. P., Chang, F. K.
IOP PUBLISHING LTD.2005: S98-S103

- **Scattering of plate waves by a cylindrical inhomogeneity** *JOURNAL OF SOUND AND VIBRATION*
Wang, C. H., Chang, F. K.
2005; 282 (1-2): 429-451
- **Detection and monitoring of hidden fatigue crack growth using a built-in piezoelectric sensor/actuator network: I. Diagnostics** *SMART MATERIALS & STRUCTURES*
Ihn, J. B., Chang, F. K.
2004; 13 (3): 609-620
- **Detection and monitoring of hidden fatigue crack growth using a built-in piezoelectric sensor/actuator network: II. Validation using riveted joints and repair patches** *SMART MATERIALS & STRUCTURES*
Ihn, J. B., Chang, F. K.
2004; 13 (3): 621-630
- **A synthetic time-reversal imaging method for structural health monitoring** *SMART MATERIALS & STRUCTURES*
Wang, C. H., Rose, J. T., Chang, F. K.
2004; 13 (2): 415-423
- **Ferroelectric and piezoelectric properties of disk shape lead zirconate titanate thick films** *MATERIALS TRANSACTIONS*
Iijima, T., Ito, S., Matsuda, H., Dugnani, R., Chang, F. K.
2004; 45 (2): 233-235
- **Damage tolerance of notched composite laminates with reinforcing strips** *JOURNAL OF COMPOSITE MATERIALS*
Qing, X. L., Chang, F. K., Starnes, J.
2003; 37 (2): 111-128
- **Vibration analysis of delaminated composite beams and plates using a higher-order finite element** *INTERNATIONAL JOURNAL OF MECHANICAL SCIENCES*
Hu, N., Fukunaga, H., Kameyama, M., Aramaki, Y., Chang, F. K.
2002; 44 (7): 1479-1503
- **Magneto-rheological fluid dampers for control of bridges** *ASME International Mechanical Engineering Congress and Exposition*
Gordaninejad, F., Saiidi, M., Hansen, B. C., Ericksen, E. O., Chang, F. K.
SAGE PUBLICATIONS LTD.2002: 167-80
- **Energy absorption of braided composite tubes** *INTERNATIONAL JOURNAL OF CRASHWORTHINESS*
Beard, S. J., Chang, F. K.
2002; 7 (2): 191-206
- **Design of braided composites for energy absorption** *JOURNAL OF THERMOPLASTIC COMPOSITE MATERIALS*
Beard, S., Chang, F. K.
2002; 15 (1): 3-12
- **Structural damage identification using piezoelectric sensors** *INTERNATIONAL JOURNAL OF SOLIDS AND STRUCTURES*
Fukunaga, H., Hu, N., Chang, F. K.
2002; 39 (2): 393-418
- **The manufacture of composite structures with a built-in network of piezoceramics** *COMPOSITES SCIENCE AND TECHNOLOGY*
Lin, M., Chang, F. K.
2002; 62 (7-8): 919-939
- **The response of composite joints with bolt-clamping loads, Part II: Model verification** *JOURNAL OF COMPOSITE MATERIALS*
Sun, H. T., Chang, F. K., Qing, X. L.
2002; 36 (1): 69-92
- **The response of composite joints with bolt-clamping loads, Part 1: Model development** *JOURNAL OF COMPOSITE MATERIALS*
Sun, H. T., Chang, F. K., Qing, X. L.
2002; 36 (1): 47-67
- **Structural health monitoring from fiber-reinforced composites to steel-reinforced concrete** *European COST F3 Conference on System Identification and Structural Health Monitoring*

Wang, C. S., Wu, F., Chang, F. K.
IOP PUBLISHING LTD.2001: 548–52

- **Impact identification of stiffened composite panels: II. Implementation studies** *SMART MATERIALS & STRUCTURES*
Seydel, R., Chang, F. K.
2001; 10 (2): 370-379
- **Characterization of matrix crack-induced laminate failure - Part II: Analysis and verifications** *JOURNAL OF COMPOSITE MATERIALS*
Johnson, P., Chang, F. K.
2001; 35 (22): 2037-2074
- **Characterization of matrix crack-induced laminate failure - Part I: Experiments** *JOURNAL OF COMPOSITE MATERIALS*
Johnson, P., Chang, F. K.
2001; 35 (22): 2009-2035
- **Modelling of splitting and delamination in notched cross-ply laminates** *COMPOSITES SCIENCE AND TECHNOLOGY*
Wisnom, M. R., Chang, F. K.
2000; 60 (15): 2849-2856
- **Experimental study on clamping effects on the tensile strength of composite plates with a bolt-filled hole** *COMPOSITES PART A-APPLIED SCIENCE AND MANUFACTURING*
Yan, Y., Wen, W. D., Chang, F. K., Shyprykevich, P.
1999; 30 (10): 1215-1229
- **Identifying impacts in composite plates with piezoelectric strain sensors, Part I: Theory** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*
Tracy, M., Chang, F. K.
1998; 9 (11): 920-928
- **Identifying impacts in composite plates with piezoelectric strain sensors, Part II: Experiment** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*
Tracy, M., Chang, F. K.
1998; 9 (11): 929-937
- **Structural health monitoring** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*
Pines, D. J., Chang, F. K.
1998; 9 (11): 875-875
- **Composite hip prosthesis design .1. Analysis** *JOURNAL OF BIOMEDICAL MATERIALS RESEARCH*
Yildiz, H., Ha, S. K., Chang, F. K.
1998; 39 (1): 92-101
- **Identification of impact force and location using distributed sensors** *AIAA JOURNAL*
Choi, K. Y., Chang, F. K.
1996; 34 (1): 136-142
- **Strength envelope of bolted composite joints under bypass loads** *JOURNAL OF COMPOSITE MATERIALS*
Hung, C. L., Chang, F. K.
1996; 30 (13): 1402-1435
- **Bearing failure of bolted composite joints .2. Model and verification** *JOURNAL OF COMPOSITE MATERIALS*
Hung, C. L., Chang, F. K.
1996; 30 (12): 1359-1400
- **IDENTIFYING DELAMINATION IN COMPOSITE BEAMS USING BUILT-IN PIEZOELECTRICS .1. EXPERIMENTS AND ANALYSIS** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*
Keilers, C. H., Chang, F. K.
1995; 6 (5): 649-663
- **IDENTIFYING DELAMINATION IN COMPOSITE BEAMS USING BUILT-IN PIEZOELECTRICS .2. AN IDENTIFICATION METHOD** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*

- Keilers, C. H., Chang, F. K.
1995; 6 (5): 664-672
- **AN ACCUMULATIVE DAMAGE MODEL FOR TENSILE AND SHEAR FAILURES OF LAMINATED COMPOSITE PLATES** *JOURNAL OF COMPOSITE MATERIALS*
Shahid, I., Chang, F. K.
1995; 29 (7): 926-981
 - **PREDICTING SCALING EFFECT ON THE NOTCHED STRENGTH OF PREPREG AND FIBER TOW-PLACED LAMINATED COMPOSITES** *JOURNAL OF COMPOSITE MATERIALS*
Shahid, I., Sun, H. T., Chang, F. K.
1995; 29 (8): 1063-1095
 - **MATRIX CRACKING AND DELAMINATION IN LAMINATED COMPOSITE BEAMS SUBJECTED TO A TRANSVERSE CONCENTRATED LINE LOAD** *JOURNAL OF COMPOSITE MATERIALS*
Sheng, L., KUTLU, Z., Chang, F. K.
1993; 27 (5): 436-470
 - **MODELING COMPRESSION FAILURE OF LAMINATED COMPOSITES CONTAINING MULTIPLE THROUGH-THE-WIDTH DELAMINATIONS** *JOURNAL OF COMPOSITE MATERIALS*
KUTLU, Z., Chang, F. K.
1992; 26 (3): 350-387
 - **A MODEL FOR PREDICTING DAMAGE IN GRAPHITE EPOXY LAMINATED COMPOSITES RESULTING FROM LOW-VELOCITY POINT IMPACT** *JOURNAL OF COMPOSITE MATERIALS*
Choi, H. Y., Chang, F. K.
1992; 26 (14): 2134-2169
 - **IMPACT DAMAGE RESISTANCE OF GRAPHITE EPOXY LAMINATED COMPOSITES** *POLYMER COMPOSITES - 90 CONF*
Choi, H. Y., Chang, F. K.
SOC PLASTICS ENG INC.1991: 1294-1300
 - **A NEW APPROACH TOWARD UNDERSTANDING DAMAGE MECHANISMS AND MECHANICS OF LAMINATED COMPOSITES DUE TO LOW-VELOCITY IMPACT .2. ANALYSIS** *JOURNAL OF COMPOSITE MATERIALS*
Choi, H. Y., WU, H. Y., Chang, F. K.
1991; 25 (8): 1012-1038
 - **A NEW APPROACH TOWARD UNDERSTANDING DAMAGE MECHANISMS AND MECHANICS OF LAMINATED COMPOSITES DUE TO LOW-VELOCITY IMPACT .1. EXPERIMENTS** *JOURNAL OF COMPOSITE MATERIALS*
Choi, H. Y., DOWNS, R. J., Chang, F. K.
1991; 25 (8): 992-1011
 - **MODELING THE VISCOPLASTIC BEHAVIOR OF FIBER-REINFORCED THERMOPLASTIC MATRIX COMPOSITES AT ELEVATED-TEMPERATURES** *JOURNAL OF COMPOSITE MATERIALS*
Ha, S. K., Wang, Q. L., Chang, F. K.
1991; 25 (4): 334-374
 - **DAMAGE TOLERANCE OF LAMINATED COMPOSITES CONTAINING AN OPEN HOLE AND SUBJECTED TO TENSILE LOADINGS** *JOURNAL OF COMPOSITE MATERIALS*
Chang, K. Y., Liu, S., Chang, F. K.
1991; 25 (3): 274-301
 - **EFFECT OF LOAD DISTRIBUTION ON THE FIBER BUCKLING STRENGTH OF UNIDIRECTIONAL COMPOSITES** *JOURNAL OF COMPOSITE MATERIALS*
Lessard, L. B., Chang, F. K.
1991; 25 (1): 65-87
 - **DAMAGE TOLERANCE OF LAMINATED COMPOSITES CONTAINING AN OPEN HOLE AND SUBJECTED TO COMPRESSIVE LOADINGS .2. EXPERIMENT** *JOURNAL OF COMPOSITE MATERIALS*
Lessard, L. B., Chang, F. K.
1991; 25 (1): 44-64

- **DAMAGE TOLERANCE OF LAMINATED COMPOSITES CONTAINING AN OPEN HOLE AND SUBJECTED TO COMPRESSIVE LOADINGS .1. ANALYSIS** *JOURNAL OF COMPOSITE MATERIALS*
Chang, F. K., Lessard, L. B.
1991; 25 (1): 2-43
- **STUDY ON IMPACT DAMAGE IN LAMINATED COMPOSITES** *1989 ARMY SYMP ON SOLID MECHANICS : MECHANICS OF ENGINEERED MATERIALS AND APPLICATIONS*
Chang, F. K., Choi, H. Y., Jeng, S. T.
ELSEVIER SCIENCE BV.1990: 83-95
- **ANALYSIS OF THICK LAMINATED COMPOSITES** *JOURNAL OF COMPOSITE MATERIALS*
Chang, F. K., Perez, J. L., Chang, K. Y.
1990; 24 (8): 801-822
- **STIFFNESS AND STRENGTH TAILORING OF A HIP-PROSTHESIS MADE OF ADVANCED COMPOSITE-MATERIALS** *JOURNAL OF BIOMEDICAL MATERIALS RESEARCH*
Chang, F. K., Perez, J. L., Davidson, J. A.
1990; 24 (7): 873-899
- **DELAMINATION EFFECTS ON COMPOSITE SHELLS** *JOURNAL OF ENGINEERING MATERIALS AND TECHNOLOGY-TRANSACTIONS OF THE ASME*
Chang, F. K., KUTLU, Z.
1990; 112 (3): 336-340
- **CHARACTERIZATION OF IMPACT DAMAGE IN LAMINATED COMPOSITES** *SAMPE JOURNAL*
Chang, F. K., Choi, H. Y., Jeng, S. T.
1990; 26 (1): 18-25
- **STUDY ON THE CRUSHING RESPONSE OF CYLINDRICAL COMPOSITE SHELLS SUBJECTED TO TRANSVERSE LOADING** *JOURNAL OF COMPOSITES TECHNOLOGY & RESEARCH*
Chang, F. K., KUTLU, Z.
1990; 12 (4): 239-244
- **PREDICTING MODULI AND STRENGTHS REDUCTION OF UNIDIRECTIONAL GRAPHITE EPOXY COMPOSITES DUE TO HYGROTHERMAL EFFECTS** *JOURNAL OF REINFORCED PLASTICS AND COMPOSITES*
Chang, F. K., Shahid, I., ENGD AHL, R. A.
1989; 8 (2): 106-132
- **STRENGTH AND RESPONSE OF CYLINDRICAL COMPOSITE SHELLS SUBJECTED TO OUT-OF-PLANE LOADINGS** *JOURNAL OF COMPOSITE MATERIALS*
Chang, F. K., KUTLU, Z.
1989; 23 (1): 11-31
- **TRANSIENT DYNAMIC ANALYSIS OF LAMINATED COMPOSITE PLATES SUBJECTED TO TRANSVERSE IMPACT** *COMPUTERS & STRUCTURES*
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