PETITION FOR IUS PROMOVENDI
DOCTORAL PROGRAM IN ENGINEERING
EAFIT UNIVERSITY

Professor's name:	JUAN DAVID GÓMEZ CATAÑO	
Departments of engagement:	CIVIL ENGINEERING	
Areas of the Proposal for Doctoral work:	APPLIED MECHANICS	
Colciencias Research Groups hosting Professor:	Group Name: MECÁNICA APLICADA	Colciencias Class: A
Date of Request:	Tuesday, November 18, 2008	

INSTRUCTIONS:

1. The Board of the Doctoral Program in Engineering at EAFIT University may request the necessary documents to support the information contained in this form. Please have then ready.
2. Please read the Statement of Purpose of the Doctoral Program before filling this form.

Statement of Purpose of the Doctoral Program in Engineering at EAFIT

EAFIT aims to prepare and train its graduate engineering students in an internationally standardized Doctoral Program. Central to the Engineering PhD program is to provide the doctoral student with fundamental, high level scientific knowledge and the training to articulate such knowledge into research, development and innovation tangible achievements. As a consequence, it is a central responsibility of the Doctoral Supervisor to commit to research endeavors which in a fundamental manner drive the doctorand to learn and work with formal theoretical knowledge which will allow several successful changes of research goals during the active life of the future Doctor. As economical, environmental, political changes affect government and private investment funding and interest for particular areas, the doctor of EAFIT University must count with lasting scientific and technical foundations to re-invent his/her research interests accordingly. In this regard, the Doctoral program does not rule out novel or fashionable research fields. However, their acceptance for doctoral research is solidly coupled with the concept of fundamental durability above.

The actors in the Doctoral Program in Engineering at EAFIT (supervisor, Board, doctorand, clerical and technical support) articulate a system which ensures the ethic, responsibility and transparency of procedures. The completion of goals connected with external funding have the same institutional treatment, according to such characteristics.

The Board of the Doctorate for Engineering at EAFIT will evaluate the request for Ius Promovendi under the previous considerations.

1. SCIENTIFIC KERNEL OF THE DOCTORAL TRACK.

In this section, the doctoral supervisor must present the research track intended and make the point for the quality of the research area and benefit for the doctoral student based on the statement of purpose above.

Please repeat this table up to three times (maximal 3 research topics).

Topic 1	Name of Topic: **Behavior of Metallic Materials at Small Volumes Under General Loading Conditions.**	300 words

The recent trend towards miniaturization in different engineering fields has led the applied mechanics community to face new questions and challenges that were considered solved at the macro scale. This relatively new form of engineering has been generally termed as micro-engineering.

The Doctoral Track in **Plasticity of Metals at Small Scales** has as a main goal the prediction of the nonlinear response of metallic materials applied at small volumes via non-classical continuum mechanics theories combined with numerical methods. This is to be achieved via research in two inter-related constituent problems:

- The identification and proper formulation of new constitutive models that can properly deal with behavior at small scales. What is the true nature of the relation between stress and strain at the small scale level? What of the previously formulated non-classical continuous theories has the strongest physical basis?
- The formulation of numerical approaches to address the new continuity requirements imposed by non-classical continuum mechanics theories. What is the appropriate numerical scheme and its mathematical support to solve problems at the small scales?. How to deal with issues as the stronger continuity requirements imposed by the new kinematic variables inherent in the non-classical theories?

Partner Investigator:	Dr Cemal Basaran.
Entity of partner investigator:	UNIVERSITY AT BUFFALO-ELECTRONICS PACKGING LABORATORY
Joint publications with partner (please be precise).	"Computational Implementation of Inelastic Cosserat Continuum". Gomez, J. and Basaran, C. International Journal of Materials and Product Technology. August 2008. In Press. "Determination Of Strain Gradient Plasticity Length Scale For Microelectronics Solder Alloys" Gomez, J. and Basaran, C ASME Journal of Electronic Packaging.

	Vol. 129, No. 2, pp-120-128. September 2007 ISSN: 1528-9044 "Damage Mechanics Constitutive Model For Pb/Sn Solder Joints Incorporating Nonlinear Kinematic Hardening and Rate Dependent Effects Using a Return Mapping Integration Algorithm." Gomez, J and Basaran, C. Mechanics of Materials. Vol 38 Issue 6. pp 585-598 July 2006. ISSN: 0167-6636 "Modeling of Concurrent Thermal and Vibration Loadings on Electronic Packages with Solder Alloys Interconnects." Gomez, J., Lin, M., and Basaran, C. Multidiscipline Modeling in Materials and Structures. Vol 2, No 3. pp 1-18. May 2006 ISSN: 1573-6105 E-ISSN: 1573-6113 "Nanoindentation of Pb/Sn Solder Alloys; Experimental and Finite Element Simulation Results." Gomez, J and Basaran, C. International Journal of Solids and Structures. Vol 43 Issue 6. pp1505-1527. March 2006 ISSN: 0020-7683 "A Damage-Mechanics-Based Constitutive Model for Solder Joints." Basaran, C., Zhao, Y., Tang, H., Gomez, J. ASME Journal of Electronic Packaging. Vol 127, September 2005. ISSN: 1528-9044 "A Thermodynamics Based Damage Mechanics Constitutive Model for Low Cycle Fatigue Analysis of Microelectronics Solder Joints Incorporating Size Effects." Gomez, J., and Basaran, C. International Journal of Solids and Structures.

	Vol 42. pp 3744-3772. January 2005. ISSN: 0020-7683
Joint Projects with partner (please be precise).	None
Resources Leveraged with this Institution? Please Specify (internships, equipment, training, cash).	None

Topic 2	Name of Topic: **Spectral Approach to Seismic Soil-Structure Interaction Problems due to Local and Regional Effects.**	300 words

Traditionally, Soil-Structure Interaction (SSI) effects have been constrained to cases where only local site conditions are considered. However it has been widely identified that regional effects like those induced by sedimentary basins also affect the motions at the soil-structure interface.

On the other hand, the traditionally proposed SSI analysis procedures require the use of acceleration time histories as the input to the problem. Although the use of time histories has a strong physical basis it is difficult, computationally expensive and unpractical to be applied in common structures such as those intended for residential use. Even without addressing SSI effects the current strategy in seismic analysis consists in treating the seismic excitations as statistical envelopes in terms of a so called response spectrum reflecting the possible incidence of many sources.

The use of the response spectrum approach coupled with SSI effects available in current seismic analysis and design regulations is based on very strong idealizations of the actual problem. As a result the very robust techniques that have been developed are either used exclusively for a few essential structures or for research purposes.

In this research topic termed **"Spectral Approach to Seismic Soil-Structure Interaction Problems due to Local and Regional Effects"** we intend to couple regional factors together with an spectral scheme that modifies the traditionally used response spectra without modifying the structure dynamical properties. Two main problems constitute the research topic:

- First, what is the actual physical behavior of sedimentary basins under incident seismic waves?. Here we intend to gain understanding of the actual phenomena itself in contrast to the traditional approach based on numerical simulations of particular cases.
- Second, what is the best physically based approach to incorporate the regional effects into the local SSI problem? What are the right modifications that must be applied to current code design response spectra in order to reflect SSI regional and local effects?

Partner Investigator:	Dr Juan Diego Jaramillo F.
Entity of partner investigator:	EAFIT UNIVERSITY
Joint publications with partner (please be precise).	"Efectos de Sitio por resonancia Geométrica". Jaramillo. J.D, Gomez, J.D y Restrepo, D.L. Revista de la Facultad de Ingeniería de la UPTC. Aceptado para publicación.
Joint Projects with partner (please be precise).	"A Computational Tool for The numerical Simulation of Seismic Waves in Sedimentary Basins Using a Hybrid FEM-BEM Technique". Joint Grant from Colciencias and EAFIT UNVERSITY 2005-2006-CONCLUDE. "A Computational Tool for the Analysis of SSI Problems Via an Spectral Approach". Joint grant from Colciencias-Solingral S.A and EAFIT UNIVERSITY. 2008-2010 "Physically Based Modifications to the Seismic Design Response Spectra due to SSI Phenomena" Joint Grant from Colciencias and EAFIT UNVERSITY 2008-2010. "Parametric Study of the Incidence of Topographical and subsurface Anomalities in the Seismic Response of Sedimentary Basins." Joint grant from Colciencias-E.I.P L.T.D.A and EAFIT UNIVERSITY. 2008-2010.
Resources Leveraged with this Institution? Please Specify (internships, equipment, training, cash).	Not Applicable

2. NECESSARY PREPARATION IN FORMAL KNOWLEDGE. COURSES.

Please repeat the following table as many times as needed for the courses or formal knowledge areas required.

TOPIC LIST	COURSE INFO	COURSE TYPE	OBSERVATIONS	
1 SCALARS, VECTORS AND DYADICS. 2 TENSORIAL ANALYSIS. 3 POWER SERIES SOLUTIONS. 4 THE LAPLACE TRANSFORM. 5 THE FOURIER TRANSFORM. 6 THE HEAT EQUATIONS 7 THE DIFFUSION EUATION 8 THE WAVE EQUATION. [GR] Greenberg, Michael. (1998). Advanced Engineering Mathematics. Second edition. Prentice Hall. Upper Saddle River, New Jersey. [WI] Wiley, C. Ray (1982). Matemáticas Superiores para Ingenieria. Cuarta edición. McGraw Hill. [MA] Mase, George E (1978). Teoria y Problemas de Mecánica del Medio Continuo. Serie de Compendios Schaum. McGraw Hill. [SH] Shames Irving and Cozzarelli Francis (1997). Elastic and Inelastic Stress Analysis. Revised Printing. Taylor and Francis.]	ADVANCED ENGINEERING MATHEMATICS	Undergrad Compulsory	Y☐	N☒
	Course Exists? Y☒ / N ☐	Regular Undergrad Elective	Y☐	N☒
	EAFIT Course Code:	Independent Study Undergrad	Y☐	N☒
		Regular Graduate Elective	Y☐	N☒
		Independent Study Graduate	Y☐	N☒
		To be taken in another University	Y☐	N☒
If taken in another University, why? .				

TOPIC LIST	COURSE INFO	COURSE TYPE	OBSERVATIONS	
1 BASIC ASSUMPTIONS. 2 SYSTEMS OF REFERENCE. 3 THE MATERIAL DERIVATIVE. 4 TENSORIAL ANALYSES AND	ADVANCED CONTINUUM MECHANICS	Undergrad Compulsory	Y☐	N☒

REVIEW OF FIELD THEORY. 5 INTERACTION ANALYSIS AND CONSERVATIN LAWS. 6 ANALYSES OF CHANGING CONFIGURATION. 7 FORMULATIONS OF BOUNDARY VALUE PROBLEMS AND METHODS OF SOLUTION. 7 THE LINEARIZED THEORY OF ELASTICITY. 8 SOME CLOSED FORM SOLUTIONS. 9 VARIATIONAL PRINCIPLES AND A PREVIEW OF COMPUTATIONAL METHODS. [MS] Mase, T and Mase, G (1999) "Continuum Mechanics for Engineers". CRC Press. [MA] Malvern, L(1969) "Introduction to the Mechanics of a Continuous Medium". Prentice Hall, New Jersey. [SC] Shames, I and Cozzarelli, F(1997) "Elastic and Inelastic Stress Analysis". Taylor and Francis. [YC] Fung, Y.C and Tong, P(2001) "Classical and computational solid mechanics". World Scientific. [TI] Timoshenko, T and Goodier, J(1970) "Theory of Elasticity" Third edition. International Student Edition. McGraw-Hill International. [LO] Love, A.E.H(1944) "A Treatise on the Mathematical Theory of Elasticity". Reprinted Dover Publications. [JH] Cadavid, J.H (2007) "Mecánica del Medio Continuo-Una Iniciación". En Edición-Fondo Editorial				
	Course Exists? Y☒ / N ☐	Regular Undergrad Elective	Y☐	N☒
	EAFIT Course Code:	Independent Study Undergrad	Y☐	N☒
		Regular Graduate Elective	Y☐	N☒
		Independent Study Graduate	Y☐	N☒
		To be taken in another University	Y☐	N☒

Universidad EAFIT. [JG] Gomez, J (2008) "Class Notes" Distributed via web.				
If taken in another University, why? .				

TOPIC LIST	COURSE INFO	COURSE TYPE	OBSERVATIONS	
1 MATHEMATICAL MODELS AND THEIR SOLUTION VIA FEM. 2 NATURALLY DISCRETE SYSTEMS AND NATURALLY CONTINOUS SYSTEMS. 3 THE GENERAL BOUNDARY VALUE PROBLEM-REVIEW OF THE LINEARIZED THEORY OF ELASTICITY AND VARIATIONAL PRINCIPLES. 4 FORMULATION OF THE DISPLACEMENT BASED FINITE ELEMENT METHOD. 5 CONVERGENCE OF ANALYSIS RESULTS. 6 ISOPARAMETRIC FINITE ELEMTNS, NUMERICAL INTEGRATION. 7 APPLICATIONS. 8. COMPUTATIONAL ASPECTS. 9 COUPLING THE FEM AND THE BEM METHODS. [BA] Bathe K-J(1998). "Finite Element Procedures". Prentice Hall, Englewood Cliffs, New Jersey. [ZI] Zienckiewicz, O.C and Taylor, R.L (1999). "The Finite Element Method", Volumenes 1 y 2. McGraw-Hill Book Company. [TI] Timoshenko, T and Goodier, J(1970) "Theory of Elasticity" Third edition. International Student Edition. McGraw-Hill International. [SH] Simo, J and Hughes, T(1997). "Computational	INTRODUCTION TO THE FINITE ELEMENT METHOD	Undergrad Compulsory	Y☐	N☒
	Course Exists? Y☒ / N ☐	Regular Undergrad Elective	Y☐	N☒
	EAFIT Course Code:	Independent Study Undergrad	Y☐	N☒
		Regular Graduate Elective	Y☐	N☒
		Independent Study Graduate	Y☐	N☒
		To be taken in another University	Y☐	N☒

Inelasticity. Interdisciplinary applied mathematics. Springer.				
If taken in another University, why? .				

TOPIC LIST	COURSE INFO	COURSE TYPE	OBSERVATIONS	
1 INTRODUCTORY ASPECTS TO THE THEORY OF INTEGRAL EQUATIONS-REPRESENTATION THEOREMS. 2 WELL POSSED PROBLEMS IN ELASTICITY. 3 FUNDAMENTAL SOLUTIONS AND THE GREEN´S FUNCTIONS. 4 INTEGRAL FORMULATION OF THE BOUNDARY VALUE PROBLEM OF THEORY OF ELASTICITY. 5 COMPUTATIONAL ASPECTS. 6 LIMIT STATE OF THE REPRESENTATION THEOREM. 7 SPECIFIC FORMULATION OF DIFFERENT FIELD PROBLEMS. 8 COUPLING OF BEM AND FEM METHODS. [JG] Jaramillo, J.D y Gómez, J.D (2007) "Class notes"-Distributted via Web [Br] Brevia y Dominguez. Introduction to the Boundary Element Methods.	INTRODUCTION TO THE BOUNDARY ELEMENT METHOD	Undergrad Compulsory	Y☐	N☒
	Course Exists? Y☒ / N ☐	Regular Undergrad Elective	Y☐	N☒
	EAFIT Course Code:	Independent Study Undergrad	Y☐	N☒
		Regular Graduate Elective	Y☐	N☒
		Independent Study Graduate	Y☐	N☒
		To be taken in another University	Y☐	N☒
If taken in another University, why? .				

3. PRESENTATION OF THE RESEACH GROUP.

3.1 Technical Table of the Group

Name of Group	Applied Mechanics		
Current Colciencias Classification	A		
Leader of Group:	Manuel Julio Garcia Ruiz		
Name List of Permanent Senior (Ph.D.) Investigators:	Position Name	Institution	Technical Field
	MANUEL JULIO GARCIA RUIZ	EAFIT UNIVERSITY	APPLIED MECHANICS
	JUAN DIEGO JARAMILLO F	EAFIT UNIVERSITY	APPLIED MECHANICS
	JUAN CARLOS BOTERO P.	EAFIT UNIVERSITY	STRUCTURAL ANALYSIS.
	JUAN DAVID GOMEZ C	EAFIT UNIVERSITY	COMPUTATIONAL MECHANICS.
Name List of Formalized Senior (PhD) foreign collaborators:	Position Name	Institution	Technical Field
	NONE		
Name List of Non-formalized Senior (PhD) foreign collaborators:	Position Name	Institution	Technical Field
	NONE		
Number of Journal Papers (last 5 years)	~10		
Number of International Conference Papers (last 5 years)	~5		
Number, Identification, Date of Patents & Software Registration.	None		
Accumulated External Funding (last 5 years, millions of Col$) leveraged.	1.000		

3.2 Biographical Data of the Thesis Supervisor

Name	JUAN DAVID GOMEZ CATAÑO
B.Sc. Area, Institution, year	CIVIL ENGINEERING, UNIVERSIDAD DE MEDELLIN, 1996
M.Sc. Area, Institution, year	STRUCTURAL ENGINEERING, UNVERSITY AT BUFFALO, 2000
Ph.D. Area, Institution, year, supervisor	COMPUTATIONAL MECHANICS, UNIVERSITY AT BUFFALO, 2006
Title of the Doctoral Thesis	"A Thermodynamics Based Damage Mechanics Framework For Fatigue Analysis of Microelectronics Solder Joints With Size Effects"
Number of Journal Publications last 5	9

years.	
Number of Conference Publications last 5 years.	10
International Journals in which Supervisor is part of Technical Committee (names).	ASME JOURNAL OF ELECTRONICS PACKAGING
National Journals in which Supervisor is part of Technical Committee (names).	NONE
International Conferences in which Supervisor is part of Technical Committee (names+years).	NONE
Books published (Name + ISBN number)	NONE
Chapters in Books (Name of Book + ISBN Number)	NONE

3.3 Previous PhD, MSc, B.Sc. Graduation Projects Supervised.

NONE

Student's Name	Ph.D. / M.Sc. / B.Sc.	Title of Thesis	International Partners	Current Position of Student

3.4 External Economical Resources Leveraged by Applicant.

Financing Institution	Dates	Beneficiary Student(s)	Amount Leveraged	Technical Name of Product

3.5 International Journal Publications of Supervisor (last 5 years).

Paper	Impact Factor (UKWN= unknown)
Gomez, J., and Basaran, C (2005). A Thermodynamics Based Damage Mechanics Constitutive Model for Low Cycle Fatigue Analysis of Microelectronics Solder Joints Incorporating Size Effects. International Journal of Solids and Structures. Vol 42. pp 3744-3772.	UKWN

Gomez, J., Lin, M., and Basaran, C (2006). Modeling of Concurrent Thermal and Vibration Loadings on Electronic Packages with Solder Alloys Interconnects. Multidiscipline Modeling in Materials and Structures. Vol 2, No 3. pp 1-18.	UKWN
Basaran, C., Zhao, Y., Tang, H., **Gomez, J** (2008). A Damage-Mechanics-Based Constitutive Model for Solder Joints. ASME Journal of Electronic Packaging. Vol 127, September	UKWN
Gomez, J and Basaran, C (2006a). Damage Mechanics Constitutive Model For Pb/Sn Solder Joints Incorporating Nonlinear Kinematic Hardening and Rate Dependent Effects Using a Return Mapping Integration Algorithm. Mechanics of Materials. Vol 38 Issue 6. pp 585-598	UKWN
Gomez, J and Basaran, C (2006b). Nanoindentation of Pb/Sn Solder Alloys; Experimental and Finite Element Simulation Results. International Journal of Solids and Structures. Vol 43 Issue 6. pp1505-1527.	UKWN
Gomez, J. and Basaran, C (2007) Determination Of Strain Gradient Plasticity Length Scale For Microelectronics Solder Alloys. ASME Journal of Electronic Packaging, Vol. 129, No. 2, pp-120-128.	UKWN
Gomez, J. and Basaran, C.(2008). Computational Implementation of Inelastic Cosserat Continuum. International Journal of Materials and Product Technology. August 2008. In Press.	UKWN

3.6 National Journal Publications of Supervisor (last 5 years).

Paper	Impact Factor (UKWN= unknown)
Gomez, J. (2005). Algoritmo de Integración Para Materiales No Lineales Considerando los Efectos de Visco Plasticidad, Endurecimiento Cinemático No Lineal y Daño. Revista Escuela de Ingeniería de Antioquia, No 3, pp 35-50.	UKWN
Gomez, J. (2007). Desarrollo de un Modelo Constitutivo para Problemas de Fatiga Termomecánica Acoplada con Efectos de Tamaño Via La Mecanica del Daño Continuo. Scientia et Técnica, Año XIII, No 36, pp737-742.	UKWN
Jaramillo, J.D, Gomez, J. y Restrepo, D.L (2008). Efectos de Sitio por Resonancia Geométrica. Revista de la facultad de Ingeniería UPTC. Aceptado para publicación.	UKWN

3.7 International Conference Publications of Supervisor (last 5 years).

"Length Scale in Solder Joint Materials"
Gomez, J. and Basaran, C.
International Mechanical Engineering Congress & Exposition
Chicago, Illinois, USA
November 5-10, 2006.

"High-Temperature, High-Density Packaging Of A 60 kW Converter For Greater Than 200 C Embedded Operation."
D.C. Hopkins, D.W. Kellerman, R.A. Wunderlich, C. Basaran, J. Gomez.
Presented at the Applied Power Electronics Conference and Exposition
Section 24.3
Dallas, TX
Marzo 19-23, 2006.

"Low Cycle Fatigue Analysis of Microelectronics Solder Joints Incorporating Damage and Size Effects Using a Thermodynamics Based Rate Dependent Constitutive Model."
Gomez, J., and Basaran, C.
Proceedings 55th Electronic Components and Technology Conference.
Institute of Electrical and Electronical Engineers. (IEEE).
Lake Buena Vista, Florida, USA.
May 31-June 3, 2005.
Vol 1, pp 1006-1015
ISBN: 0-7803-8906-9

"A Damage Mechanics Based Constitutive Model for Low Cycle Fatigue Analysis of MEMS Systems."
Gomez, J., and Basaran, C.
Presented at the 37th International Symposium on Microelectronics.
Long Beach, CA.
November 14-18, 2004.
ISBN: 0-930815-74-2

"Numerical Simulation of Monotonic and Fatigue Shear Testing of Thin Layer
Solder Joints Using a Damage Mechanics Based Constitutive Model."
Gomez, J and Basaran, C.
Presented at the summer meeting of the Applied Mechanics and Materials Division of the ASME.
Scottsdale, Arizona.
June 2003.
ISBN:

Damage Mechanics Modeling of Concurrent Thermal and Vibration Loading On Electronics Packaging. C. Basaran, J. Gomez, M. Lin, and S. Li . Proc. Of the Summer Simulation Multiconference 2007, Organized by Society for Modeling and Simulation July 14-18, 2007, San Diego, CA
ISBN:

"Desarrollo de un Modelo Constitutivo para Problemas de Fatiga Termomecánica Acoplada con Efectos de Tamaño Via La Mecanica del Daño Continuo"
Gomez, J
IV Congreso Internacional de Materiales.
Universidad Tecnológica de Pereira
Pereira, Colombia
Septiembre 10-14 de 2007

Popayán
Jaramillo, J y Gomez, J
Efectos de Sitio por Resonancia Geométrica.
2007

"Desarrollo de una Herramienta Computacional Combinando los Métodos de Elementos Finitos y Elementos de Frontera para el Estudio de la Respuesta Sísmica en 2 Dimensiones."
Gomez, J y Jaramillo, J.
III Congreso Colombiano y VIII Seminario Internacional de Ingeniería Sísmica.
Santiago de Cali, Colombia
Noviembre 16-19 de 2005.
ISBN:958-670-464-5

"Sistemas Pasivos de Disipación de Energía en Ingeniería Sísmica; Métodos Simplificados de Análisis"
Conferencista Invitado
Gomez J.
Semana Internacional de La Ingeniería Civil.Medellín Mayo 16 al 20 del 2005.

References REQUIRED FOR THE DOCTORAL TRACK DIFFERENT FROM APPLICANT'S publications

Abu Al-Rub, R. K(2004). Material Length Scales in Gradient-Dependent Plasticity/Damage and Size Effects: Theory and Computations. PhD Dissertation, Louisiana State University.

Abu Al-Rub, R.K., and Voyiadjis, G(2004). Analytical and Experimental Determination of the Material Intrinsic Length Scale of Strain Gradient Plasticity Theory From Micro- And Nano-Indentation experiments. International Journal of Plasticity. Vol 20, pp 1139-1182.

Acharya, A., and Bassani, J.L(1996). On non-local flow theories that preserve the classical structure of incremental boundary value problems. In Pineau, A., Zaoui, A (Eds.), IUTAM Symposium on Micromechanics of Plasticity and Damage of Multiphase Materials. Kluwer Academic Publishers, Dordrecht, pp 3-9.

Acharya, A., and Bassani, J.L(2000). Lattice incompatibility and a gradient theory of crystal plasticity. Journal of Mechanics and Physics of Solids. Vol 48, pp 1565-1595.

Adams, P. J(1986). Thermal Fatigue of Solder Joints in Micro-Electronic Devices. M.S. Thesis Department of Mechanical Engineering, MIT, Cambridge, MA, 1986.

Aero, E., Kuvshinsky, E(1961). Fundamental equations of the heory of elastic media with rotationally interacting particles. Soviet Physics Solid State. Vol 2. pp 1272.

Aifantis, E(1984). On the microstructural origin of certain inelastic models. Trans. ASME, J. Eng. Mat. Tech. pp 106-326.

Aifantis, E(1987). The physics of plastic deformation. International Journal of Plasticity. Vol 3, pp 211-247.

Aifantis, E(1992). On the role of gradients in localization of deformation and fracture. International Journal of Engineering Science. Vol 30, pp 1279-1299.

Alfano, G., De Angelis, F., and Rosati, L(2001). General Solution Procedures in Elasto/Viscoplasticity. Comput. Meth. Appl. Mech. Eng. No 190, pp 5123-5147.

Armstrong, P., and Frederick, C(1966). A Mathematical Representation of the Multiaxial Bauschinger Effect. CEGB Report RD/N731.

Arselinis, A., and Parks, D(1999). Crystallographic Aspects of Geometrically-necessary and Statistically-stored Dislocation Density. Acta Materialia. Vol 47, pp1597-1611.
Ashby, M(1970). The deformation of plastically non-homogenous materials. Phil Mag. Vol 21, pp399-424.
Ashby, M(1971). The deformation of plastically non-homogenous alloys. Strengthening Methods in Crystals. A. Kelly and Nicholson, R.B, editors. Chapter 3, pp137-192.
Atkins, A.g., and Tabor, D.T(1965). Plastic Indentations in Metals With Cones. Journal of Mechanics and Physics of Solids. No 139, pp 149-164.
Bagchi, A., and Evans, A(1996). The mechanics and physics of thin film decohesion and its measurement. Interface Sci. Vol 3, pp169-193.
Barker, D., Vodzak, J., Dashgupta, A., and Pecht, M(1990). Combined Vibrational and Thermal Solder Joint Fatigue. A Generalized Strain versus Life Approach. ASME Journal of Electronic Packaging, Vol 2, pp129-134.
Basaran, C(1994). Finite Element Thermomechanical Analysis of Electronic Packaging Problems Using Disturbed State Constitutive Models. PhD Dissertation, Department of Civil Engineering and Engineering Mechanics, University of Arizona.
Basaran, C. and Chandaroy, R(1998). Mechanics of Pb40/Sn60 Near Eutectic Solder Alloys Subjected to Vibrations. Applied Mathematical Modeling, Vol 22, pp 601-627.
Basaran, C., and Gomez, J(2003). Numerical Simulation of Monotonic and Fatigue Shear Testing of Thin Layer Solder Joints Using a Damage mechanics Based Constitutive Model. Proceedings 2003 ASME Mechanics and Materials Conference., Scottsdale, Arizona.
Basaran, C., and Jiang, J(2002). Measuring intrinsic elastic modulus of Pb/Sn solder alloys. Mechanics of Materials. Vol 34, pp 349-362.
Basaran, C., and Nie, S(2004). An Irreversible Thermodynamic Theory for Damage Mechanics of Solids. International Journal of Damage Mechanics. Vol 13, No 3, pp 205-224.
Basaran, C., and Tang, H(2002). Implementation of a thermodynamic framework for damage mechanics of solder interconnect in microelectronic packaging. Proceedings of IMECE, 2002 ASME International Mechanical Engineering Congress & Exposition., New Orleans, Louisiana.
Basaran, C., and Yan, C(1998). A Thermodynamic Framework for Damage Mechanics of Solder Joints. Journal of Electronic Packaing, Trans. ASME, 120, pp 379-384.
Basaran, C., and, Wen, Y(2003). Grain Growth in Eutectic Pb/Sn Ball Grid Array Solder Joints. Submitted.
Basaran, C., Chandaroy R. and Zhao, Y(1998). Influence of Grain Size and Microstructure on Dynamic Response of Solder Joints. 98-WA/EEP-12, ASME Publications.
Basaran, C., Zhao, Y., Tang, H., and Gomez, J(2005). A Damage Mechanics Based Unified Constitutive Model for Pb/Sn Solder Alloys. Accepted. ASME Journal of Electronic Packaging.
Bassani, J.L(2001). Incompatibility ans a simple gradient theory of plasticity. Journal of Mechanics and Physics of Solids. Vol 49, pp 1983-1996.
Bassani, J.L. Needleman, A., and Van der Giessen, E(2001). Plastic flow in a composite: a comparison of nonlocal continuum and discrete dislocation predictions. International Journal of Solids and Structures. Vol 38, pp 833-853.

Batra, R.C and Chen, L(1998). Shear Band spacing in gradient-dependent thermoviscoplastic materials. Computational Mechanics. Vol 23, pp 8-19.
Bazant, Z(1984). Size effect in blunt fracture: Concrete, rock and metal. J. Engng. Mech. No 110, Vol 4, pp 518-535.
Bazant, Z(2002). Scaling of dislocation-based strain-gradient plasticity. Journal of the Mechanics and Physics of Solids. Vol 50, pp 435-448.
Bazant, Z., and Jirasek, M(2002). Nonlocal Integral Formulations of Plasticity and Damage: Survey of Progress. Journal of Engineering Mechanics. No 128, Vol 11, pp 1119.
Bazant, Z., Belytschko, T., and Chang, T(1984). Continuum theory for strain softening. J. Eng. Mech. ASCE. Vol 110, pp 1666-1692.
Begley, M. and Hutchinson, J.W(1998). The mechanics of size dependent indentation. J.Mech.Phys.Solids. Vol 46, No 10, pp 2049-2068.
Bhattacharya, A and Nix, W(1988a). Analysis of elastic and plastic deformation associated with indentation testing of thin films on substrates. International Journal of Solids and Structures. Vol 24, No 12, pp 1287-1298.
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