

**02-10 IUTAM Symposium on Multiscale Modeling and Characterization of Elastic-Inelastic Behavior of Engineering Materials,
Marrakech, Morocco, 20-25 October, 2002**

a) Scientific Committee

S. Ahzi (France, Chair), M. Cherkaoui (France), H. Zbib (USA), P. Germain (France), E.P. Busso (UK), K. Neale (Canada), P. McHugh (Ireland), C. Miehe (Germany), S. Nemat-Nasser (USA), J. Salençon (France), E.C. Aifantis (Greece), D. McDowell (USA).

b) Short summary of scientific progress achieved

The symposium brought together scientists from various countries. There were 52 presentations including four plenary sessions, and 2 poster sessions with 12 posters. The presentations covered contemporary topics in multiscale modeling and characterization of materials behavior of engineering materials. The presentations and papers were selected to focus on topics related to deformation and failure in metals, alloys, intermetallics and polymers including, Experimental techniques, deformation and failure mechanisms, dislocation-based modeling, mesoscopic-macroscopic averaging schemes, application to forming processes and to phase transformation, localization and failure phenomena, and computational advances in Key areas that were covered by some of the presentations included modeling of material deformation at various scales. At the atomistic scale, results from MD simulations pertaining to deformation mechanisms in nano-crystalline materials as well as dislocation-defect interactions were presented. Advances in modeling of deformation in metals using discrete dislocation analyses were also presented, providing an insight into this emerging scientific technique that can be used to model deformation at the microscale. These presentations addressed current engineering problems, including deformation of thin films, dislocation behavior and strength during nanoindentation, strength in metal matrix composites, dislocation-crack interaction, development of textures in

polycrystals, and problems involving twinning and shape memory behavior. The presentations were very lively with heated discussions at sometimes due to the nature of the topics.

c) Countries represented and number of participants

France (24), USA (15), Japan (6), Morocco (12), Netherlands (3), Belgium (1), Switzerland (1), Hong Kong (2), Italy (1), Germany (1), Canada (1), Denmark (1), Taiwan (1), South Korea (2), Tunisia (1), United Kingdom (2), Australia (1)

d) Publication of Proceedings of the Symposium

The Proceedings will be published by Kluwer Academic Publishers in 2003 (editors, S. Ahzi, M. Charkaoui, M. Khaleel, H. Zbib and M. Zikry).

e) Financial supports

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- University of Metz, UFR MIM, Metz, France
- University Louis Pasteur, UFR IPST, Strasbourg, France

We thank our sponsors for their contribution to the success of the symposium

f) Scientific program

Session 1

Ali S. Argon (Plenary Lecture1), *New Developments in the Brittle-to-Ductile Transitions of Fracture in Intrinsically Brittle Crystals and Polycrystals, Experiments and Modeling*

Sia Nemat–Nasser (Plenary Lecture 2), *Dislocation-based Length-Scale in Crystal Plasticity, Experiments and Modeling*
P. Blanc, **C. LExcellent**, C. Bouvet and A. Vivet , *What about the yield transformation surface determination (austenite ® martensite) with the measurement of austenite and martensite lattice parameters for some shape memory alloys?*
T. Watanabe, K. Kido and S. Tsurekawa, *Well-Assembled and Crossed-Lamellar Microstructure and Robust Mechanical Properties of Bioceramic Shell Structure*

Session 2

P. Gilormini, Y. Liu and P. Ponte Castañeda, *Application of a variational self-consistent procedure to the prediction of deformation textures in polycrystals*
Y. Tomita and M. Uchida, *Characterization of Micro- to Macroscopic Deformation Behavior of Amorphous and Crystalline Polymer*
T. Leffers and O.B. Pedersen, *Cross slip viewed at the nono and micrometer scale*
E.P. Busso, G. Cailletaud, S. Quilici, *A multiscale micromechanics approach to describe environment effects on crack tip damage under cyclic loading*
D. Bacon and Yu.N. Osetsky, *Atomic-scale modelling of the dynamics of dislocation behaviour under stress*
M. O. Bloomfield, Y.-H. Im, D.Datta, M.S Shepherd, T.S. Cale, *Coalescence and Evolution of Nanoscale Islands into Polycrystalline Thin Films*
D. Thévenet, M. Abbadì, P. Hähner and A. Zeghloul, *On the Propagative Plastic Instabilities in Aluminum Alloys*

Session 3 - Poster presentations

R. Ami Saada, *Effect of some parameters on the elastoplastic behavior of green sand*
G. Simons, Ch. Weipert, J. Dual and J. Villain, *Experimental investigation of size effects in thin copper foils*
L.Nicola, E. Van der Giessen and A. Needleman, *Size effects in thin films , a discrete dislocation study*
S.M'Guil, C. Husson and S. Ahzi, *Characterization of the mechanical behavior of materials using a digital image correlation method*

O. Oussouaddi, L. Daridon, S. Ahzi and A. Zeghloul, *Shear band spacing analysis in the case of HY-100 steel and TI-6Al-4V alloy*

F. El Houdaigui, A. Molinari and L. S. Toth, *A differential scheme for the effective moduli of viscoplastic composites*

Session 4

Alain Molinari (Plenary Lecture 3), *The non-linear inclusion problem with applications to averaging schemes*

Y. Shitbutani, A. Koyama and T. Tsuru, *Collective Dislocation Behavior in Single Crystalline Aluminium under Indentation*

H. Riedel, *Simulation of Powder Processing – Models and Applications for the Ceramics and Powder Metal Industry*

K. Dang Van, *Fatigue analysis of structures by multiscale approach*

K.W. Neale, K. Inal and P.D. Wu, *Multiscale modelling of localization in sheet metals*

A. Abdul-latif, K. Saanouni and J. Ph. Dingli, *Multiaxial plastic fatigue behavior with multiscale Modeling*

G. Cailletaud, O. Diard, A. Musienko, *A model for damage opening and sliding of grain boundaries*

G. Voyiadjis, R. J. Dorgan and R. Abu Al-Rub, *Gradients of Hardening in Nonlocal Dislocation Based Plasticity*

Session 5

A.H.W. Ngan, *Global and Local Constraints in the Theory of Compaction of Granular Materials*

T. Ohashi, *Three-Dimensional Structures of the Geometrically Necessary Dislocations Generated from Non-Uniformities in Metal Microstructures*

L.S. Toth, R. Massion, S.C. Baik, *Simulation of Texture Evolution in Equal Channel Angular Extrusion of Copper Using a New Flow Field*

J.W. Kysar, *Energy Dissipation Mechanisms in Ductile Fracture*

Y. Remond, *Constitutive modeling of viscoelastic unloading of glassy polymers*

A.M. Rajendran, *A Microcracking and Spall Based Model to Describe the Dynamic Response of for Brittle Materials under Shock and Penetration Loading*

C. Y. Hsu, **B.J. Lee** and M. E. Mear, *On the constitutive theories of power-law materials containing voids*

H. Bouabid, S. Charif -d'ouazzane, Mel Kortbi and O. Fassi-Fehri, *Objective quantification of the ductility within the coupling elasticity-damage behavior: formulation*

Session 6 - Poster presentations

A.A. Benzerga, *A new model for dilational plasticity and applications to ductile solids*

M. Abbadi, P. Hähner and A. Zeghloul, *Influence of temperature and loading on the characteristics of PLC bands in an Al-Mg alloy*

L. Campagne, L. Daridon and S. Ahzi, *Planar impact simulation for ductile metals*

A. Molinari, **F. El Houdaigui** and L. S. Toth, *Validation of the tangent approach for the solution of the non-linear Eshelby inclusion problem*

C. Husson, C. Poizat, N Bahlouli, S. Ahzi, L. Merle and T. Courtin, *On plasticity and damage evolution during sheet metal blanking*

N. Fakri and L. Azrar, *Thermo-electro-elastic effective properties of piezoelectric composite materials*

Session 7

Pin Tong (Plenary lecture 4), *Size Effect of Fine Structures - Experiments and Theory*

E. Patoor, C. Niclaeys, T. Ben Zineb, *Influence of microstructural parameters on shape memory alloys behavior*

H. Shin, J.K. An and **D.N Lee**, *Analysis of Ridging in Ferritic Stainless Steels Using Crystal Plasticity Finite Element Method*

M.A. Zikry and W.M. Ashmawi, *Grain-Boundary Effects and Ductile Failure Evolution in Crystalline Aggregates*

K. Derrien and **D. Batiste**, *Particles cluster effect on the damage and failure of metal-matrix composites: micromechanical approach*

J.J.C. Remmers, R. de Borst and A. Needleman, *A cohesive segments approach for crack growth*

J.A. Young, E.M. Bringa and B.D. Wirth, *Atomistic simulations of materials deformation at high-strain rate*

H. Garmestani, B. L. Adams, G. Salehi, *Homogenization techniques based on statistical continuum approaches*

Session 8

B.L. Adams, M. Lyon, S. R. Kalidindi and H. Garmestani, *Microstructure design for polycrystalline materials*

D. Walgraef, *Reaction-Diffusion Approach to Self-Assembled Nanostructure Formation in Thin Films*

M. Tokuda, M. Ye, T. Inaba, B. Bundara and P. Sittner, *Multi-axial Behavior of Polycrystalline Shape Memory Alloy and Its Constitutive Equations*

A.A. Benzerga, A. Needleman, Y. Bréchet and E. van der Giessen, *Mesosopic simulations of easy-glide and stage II hardening*

B. N. Nguyen and **M.A. Khaleel**, *Prediction of Damage in Randomly Oriented Short Fiber Composites by Means of A Continuum Damage Mechanics Approach*

K. Chung and W. Lee, *Non-steady plane strain ideal plastic flow considering elastic dead zone*

S.R. Kalidindi, A. Salem and R.D. Doherty, *Role of deformation twinning in mechanical response of FCC and HCP metals*

P. Kanoute and J.L. Chaboche, *Multiscale Modelling of Non-linear Behaviour of Heterogeneous Materials, Comparison of recent homogenisation methods*

M.O. Ben-Salah, L. Boulmane and A. Hihi, *Thermomechanical behaviour of shape memory alloy*

Session 9

H. Zbib, *Multiscale Dislocation Dynamics Plasticity*

F. Ellyin, Z. Xia and Y. Zhang, *Prediction of mechanical properties and damage evolution in polymeric composites through meso-mechanical modelling*

A.S. Khan and Y. Suh, *Response of Ti-6Al-4V alloys over a wide range of strain rates and temperatures and constitutive modelling*

O. Bouaziz and P. Buessler, *A stress-strain mixture law without fitting parameter application to several classical problems of heterogeneous material behaviour*

C. Sansour, *On anisotropic formulations of multiplicative inelasticity*

Z. Tourki and M. Cherkaoui, *Deep drawing process of an AISI304 stainless steel, interaction between geometry tools and kinetics of plastic induced martensite from a micromechanical framework*

L. Daridon, L. Campagne, C. Poizat and S. Ahzi, *Modelling and simulation of dynamic plasticity and failure in ductile metals*

A. Jada, *Effects of polymeric additives on the morphology and the structure of the calcium carbonate material*

Report composed by Said Ahzi