

**01-4 IUTAM Symposium on Micromechanics of Martensitic Phase Transformation in Solids
Hong Kong, June 11-15, 2001**

a) Scientific Committee

Q. P. Sun (Chairman, Hong Kong, China), M. Berveiller (France), O. T. Bruhns (Germany), K. C. Hwang (China), R. D. James (USA), G. B. Olson (USA), J. Ortin (Spain), K. Tanaka (Japan), J. Engelbrecht (Estonia, IUTAM repres.).

b) Short summary of scientific progress achieved

Phase transition phenomena are of vital interest to physicists and material scientists, and to engineers who involve in the study of thermomechanical behavior of solids. The research on mechanics of phase transformations in solids has both academic and technological importance and has become one of the most attractive frontiers in applied mechanics. The wide application of smart materials and structures (such as shape memory alloys, TRIP steels, MEMS) greatly promoted the development of this interdisciplinary subject. The subject is continually growing, and new results in both fundamental and applied research are being constantly reported.

The objective of the Symposium, the first IUTAM Symposium in this emerging area, is to reflect the rapid development and to provide a forum to discuss the latest research advances and future trends in this area. It was the intension of the Scientific Committee to invite leading scientists and researchers from material science, physics and mechanics together to present and to discuss different aspects of this active multi-discipline field. During this 5-day symposium, 34 papers covering seven topics were presented and intensively discussed in the 16 sessions. The seven topics were:

1. Microstructure and deformation of interfaces and moving boundaries;
2. Material instability and its propagation during martensite phase transformation;
3. Behavior of representative volume element by micromechanics approaches;
4. Interaction between plasticity (dislocation) and phase transformation;
5. Martensitic phase transformation in thin films;
6. Size effect and scaling in martensitic phase transformations;
7. Engineering application of phase transformation in bio-materials and medical devices, intelligent materials and structures, TRIP steels, MEMS, shape memory alloys and shape memory polymers, etc.

The open and friendly environment during the Symposium provided an excellent opportunity for intensive discussions and exchanging of ideas among all participants. Also the local research students were involved in the organization of the Symposium and they benefited a lot from this symposium.

c) Countries represented and number of participants

Austria (1), Australia (1), China (9), Czech Republic (1), Estonia (2), France (5), Germany (2), Italy (1), Japan (6), Singapore (2), UK (1), USA (8)
(Not including local graduate students and research staff)

d) Publication of Proceedings of the Symposium

An extended abstract booklet was distributed at the Symposium.
The full-length papers presented at the Symposium will be published by Kluwer Academic Publishers in 2002 (editor: Q. P. Sun).

e) Financial support

The organizers extend their thanks to the following for sponsorship of this IUTAM Symposium:

- International Union of Theoretical and Applied Mechanics
- Research Grant Council of Hong Kong SAR, China
- US Army Research Office-Far East
- National Natural Science Foundation of China
- Kluwer Academic Publishers, Correct
- School of Engineering, Hong Kong University of Science and Technology
- Hong Kong Society of Theoretical and Applied Mechanics
- Hysitron, Inc. USA

f) Scientific program

Opening and Welcome:

Q. P. Sun (Chairman), N. Cue and J. Engelbrecht

Session 1

M. Berveiller, M. Cherkaoui (Keynote lecture), *Materials with TRIP effects: Mechanisms and modeling.*

Session 2

Y. Tomita, T. Iwamoto, *Constitutive equation and computational prediction of deformation behavior of TRIP steels under monotonic and cyclic loading.*
A. Berezovski, J. Engelbrecht, G.A. Maugin, *A thermodynamic approach to modeling of stress-induced phase-transition front propagation in solids.*
J.M. Ball, D. Schryvers, *The formation of macrotwins in NiAl martensite.*

Session 3

Y. Liu, *On the deformation mechanism of shape memory alloys.*
D.-N. Fang, K.-C. Hwang, *Nonlinear electromechanical deformation and fracture related to domain swithing in ferroelectric ceramics.*

Session 4

M. Tokuda, S. Sogino, T. Inaba, *Two-way shape memory effect obtained by training of combined cyclic loading.*

Session 5

K. Bhattacharya (Keynote lecture), *Domain patterns, texture and macroscopic electro-mechanical properties of ferroelectrics.*

C. Lexcellent, C. Bouvet, S. Calloch, *Multiaxial mechanical behavior of a Cu-Al-Be shape memory alloy: Experimental investigations and phenomenological modeling.*

Session 6

H. Tobushi, K. Okumura, M. Endo, S. Hayashi, *Thermomechanical properties of polyurethane-shape memory polymer.*

H. Y. Yu, *A new model for the volume fraction of martensitic transformations.*

X. Ren, *Exotic multi-scale phenomena in shape memory alloys associated with the interaction of point defects with martensitic transformation.*

Session 7

Th. Antretter, F.D. Fischer, P. Fratzl, B. Ortner, G. Cailletaud, K. Tanaka, *The transformation induced plasticity (TRIP) in a martensitically transforming steel subjected to a general loading path.*

C. Messner, E. Werner, Q.P. Sun, G. Reisner, *Free energy of martensitic transformation – from discrete to homogeneous microstructure.*

Session 8

H. Sehitoglu et al., *Single crystal deformation mechanisms in NiTi, NiTiCu And Fe-based shape memory alloys.*

B. Wang, Z. Xiao, *Dependence of energy release rate on the propagation speed of martensitic transformation in materials.*

A Roytburd and E. Patoor (Chairmen) *Round table discussion on future research directions.*

Session 9

A. Roytburd (Keynote lecture) *Martensitic transformation in constrained films.*

Session 10

E. Patoor, C. Nielaëys, S. Arbab Chirani, T. Ben Zineb, *Influence of microstructural parameters on shape memory alloys behavior.*

H. Tsai, X. Fan, *Elastic deformations in shape memory alloy fiber reinforced composites.*
J. Slutsker, A. Roytburd, *Modeling of superelastic adaptive composites.*

Session 11

Y. Liu, *Influence of plasticity on transformation behaviour of martensite in NiTi.*
W.M. Huang, J.J. Zhu, K.M. Liew, *On the description of transformation in DO3 to 18R shape memory alloys using group theory.*

Session 12

Y.C. Shu, *Pressurized heterogeneous thin films of martensitic materials.*
P. Šittner, V. Novák, P. Lukáš, M. Daymond, *Load partitioning among grains of martensitically transforming shape memory alloy polycrystals studied by in-situ neutron diffraction.*

Session 13

S. Miyazaki (Keynote lecture), *Ti-Ni sputter-deposited SMA thin films and their applications.*
O.T. Bruhns, C. Oberste-Brandenburg, *On the description of martensitic phase transformations using tensorial transformation kinetics.*

Session 14

D. Favier, L. Orgeas, Y. Liu, G. Rio, *Mechanical instability of NiTi in tension, compression and shear.*
H.-H. Dai, Q. Bi, *Phase transition phenomena of a hyperelastic rod subjected to static load.*
W. Cao, R. Ahaluwalia, *Theoretical study of heterogeneous nucleation in martensitic phase transition.*

Session 15

P. Tong, D. C. C. Lam, Q. P. Sun, *Phase transformation of thin wires in tension.*
W. Yang, F. Fang, H.T. Wang, Y.Q. Cui, *Unconventional domain bands near a crack tip in ferroelectrics.*

Session 16

D. Bernardini, *A macroscopic model for microscopically heterogeneous shape memory alloys.*
Q.P. Sun, *Effect of microstructure on the deformation of nano-grained polycrystalline NiTi wires, thin sheets and microtubes.*

Report composed by Q.P. Sun