

Reports of IUTAM Symposia held in 2004

04-1 IUTAM Symposium on Size Effects on Material and Structural Behavior at Micron- and Nanometer-Scales Hongkong, China, May 30 - June 04, 2004

a) Scientific Committee

P. Tong (Chairmen, Hong Kong, China), N. Fleck (UK), H. Gao (Germany), J. Hutchinson (USA), K.C.Hwang (Beijing, China), W. Nix (USA), A. Zaoui (France), W. Zhong (Dalian, China), L. B. Freund (IUTAM Representative).

b) Short summary of scientific progress achieved

The aim of this symposium is to bring scientists from materials science, biology, physics and mechanics together to discuss different aspects and the latest advances of this active multi-discipline field. Sponsored by the IUTAM, this 4-day symposium followed the tradition of IUTAM and was held in the single session format of IUTAM symposia. The scientific presentation and discussions focused on the following topics:

1. Behaviour of materials and structures at micron- and nanometer-scales;
 2. Physical bases of size effects;
 3. Adaptive and multi-functional behavior of materials at small scales;
 4. Size effect in fracture and phase transformation of solids;
 5. Multi-scale modeling and simulation;
 6. Microstructure and deformation with moving interfaces;
 7. Size effect in Material instability and its propagation;
- 35 oral presentations were made by distinguished scholars. Theoretical, experimental and computational aspects of the subject were discussed and addressed in the symposium. Two Round Table Discussions were arranged on the future research directions.

c) Countries represented and number of participants

60 registered participants (some of them are PhD students and Postdoctors) attended the technical session of the symposium. 35 invited speakers came from 8 countries: Australia (1), China mainland (10), France (3), USA (7), China Hong Kong (10), UK (1), Sweden (1), Germany (1), Poland (1), Taiwan (1).

d) Publication of Proceedings of the Symposium

An 8-page full-length paper is required of every speaker for inclusion in the proceedings volume. Each manuscript was reviewed by two reviewers so as to achieve an academic standard comparable to that of a refereed journal in the field. All these papers will be

published in Kluwer Academic Publisher's book series Solid Mechanics and Its Applications.

e) Financial supports

The symposium was sponsored by

- IUTAM (The International Union of Theoretical and Applied Mechanics)
- US National Science Foundation (NSF)
- RGC (Research Grant Council of Hong Kong SAR)
- NSFC (Natural Science Foundation of China)
- Kluwer Academic Publishers
- Hong Kong University of Science and Technology
- HKSTAM (The Hong Kong Society of Theoretical and Applied Mechanics)

f) Scientific program

May 31, 2004

Deformation and Diffusion in Nano-grained Metals, Wei Yang, XinLing Ma, HongTao Wang, Wei Hong

Multiscale Analysis of Strength Enhancement of Cellular Materials under Impact Loading, H.Zhao, S.Abdenadher, I.Nasri

Micromechanics of Micropolar Composites, Gengkai Hu

An MD Investigaton of the Size Effect on Multiscale Simulation of Thin Film

Delamination, Zhen Chen, Luming Shen

Fracture Analysis in the Conventional Theory of Mechanism-based Strain Gradient (CMSG) Plasticity, K. C. Hwang, S. Qu, Y. Huang, H. Jiang, C. Liu, P. D. Wu

Fractal and Scaling Phenomena on Fracture at Micro-scales, Chunsheng Lu Yiu-Wing Mai

A Multi-Scale Modeling Scheme for Sub-Micron Size Effects on Cyclic Plasticity, Jinghong Fan, Zhihui Gao, Xiangguo Zeng, Jinghong Fan

Level Set Simulations of the Formation of Dislocation Networks and Junctions, Yang Xiang, David J. Srolovitz, Weinan E, Li-Tien Cheng

Issues and Challenges in Multiscale Modeling of Bio/Nano Systems, A.M. Rajendran

June 1, 2004

Nucleation of Phases and Local Minimizers of Energy, John Ball

Solid-solid Phase Transformations: Non-existence of One-dimensional Stress Problems,

Model Equation and Uniqueness Conditions, Hui-Hui Dai

Morphological Instability and Kinetics of an Elastic Film on a Viscoelastic Substrate, R. Huang

Magnetization Reversal and Hysteresis in Nanocrystalline Ferromagnets, Jiangyu Li, Heliang Qu

Effects of the Structural Topology and Connection Size on the Strength of Circular Honeycombs under In-plane Compression, T.X. Yu, D. Karagozova

Size Effects of Nanoindentation Creep, H. Li, A.H.W. Ngan

Multi-scale Characterizations for Ductile Thin Film Delamination, Yueguang Wei, Guanshui Xu

An Experimental Investigation of the Relationship between Molecular Structure and Length Scales in Inelastic Deformation of an Amorphous Thermoplastic, Jessica Agde Tjernlund, E. Kristofer Gamstedt, Zhi-Hui Xu

Impact of Phase Transition on the Nano-indentation Hardness and Microwear Behavior of NiTi Shape Memory Alloy, Linmao Qian, Xudong Xiao, Qingping Sun, Tongxi Yu, *Round Table Discussion On Future Research Directions*, Chair: K.C. Hwang and P. Tong

June 2, 2004

Particle Size Effects in NANocomposites, A. Zaoui, V. Marcadon, E. Hervé
Mechanism-based Strain Gradient Crystal Plasticity, Chung-Souk Han, Huajian Gao, Chung-Souk Han, William D. Nix, Yonggang Huang

Size Effect in Magnetic Materials, X.X. Zhang

On Modeling Deformation Instability and Pattern Formation during Phase Transition in NiTi Microtubing, Y. J. He

Plastic Deformation of Rough Surfaces in the Nanoindentation Test, Tong-Yi Zhang

Multiscale Mechanics of Carbon Nanotubes and Their Composites, Xi-Qiao Feng
A Phase-Field Method for Optimization of Solid Structures: Cahn-Hilliard Model, Michael Yu Wang, Shiwei Zhou

Modeling of Austenite/martensite Laminates with Interfacial Energy Effect, H. Petryk, S. Stupkiewicz, G. Maciejewski

Size Effect in Nano/molecular Electromechanical Systems: Function over Strength, Wanlin Guo

Round Table Discussion On Future Research Directions, Chair: Z. Zaoui and H. Petryk

June 3, 2004

Size Effects of Phase Transition in Thin Films, C.H. Woo, B. Wang, Z. Man, Hanchen Huang

Tunable Ferroelectric Phase Transition, Biao Wang, C.H. Woo

Mechanical Strengths of Low-K Dielectric Thin Films, Sanboh Lee, T. C. Liu,
B.-T. Chen, S. M. Jang

Energy Penalties in Materials with Microstructures of Phase Transitions, Yongzhong
Huo

*Homogenization Method for Strength and Inelastic Behavior of Nanocrystalline
Materials*, Laurent Capolungo, Jianmin Qu, Mohammed. Cherkaoui

Effects of Surface Energy on the Elastic Behavior of Nano-particles, Remi Dingreville,
Jianmin Qu, Mohammed Cherkaoui

Size Effect in Formation of Junctions and Defects in Carbon Nanotubes, San-Qiang Shi,
F.Y. Meng, L.G. Zhou, F.Y. Meng, R. Yang

Report composed by Qingping Sun