

Table of Contents

Preface

Multiscale Science: Materials in the 21st Century	
J.A. Krumhansl	1
The Industrial Applications of Shape Memory Alloys in North America	
L.M. Schetky	9
Applications of Shape Memory Alloys in Japan	
M. Asai and Y. Suzuki	17
Study of Ti-Ni-Nb Shape Memory Alloys with a Wide Hysteresis	
L.C. Zhao	23
Development of a Shape Memory Alloy Damper for Intelligent Bridge Systems	
Y. Adachi, S. Unjoh and M. Kondoh	31
Development of Anti-Loosening Nuts Using Shape Memory Alloys	
X.R. Zhang, J.X. Nie and G. Hou	35
Design of a New High Pressure Apparatus Using Shape Memory Alloy	
G. Oomi, S. Aduma, I. Kosaka, T. Kagayama and M. Nishida	39
SMA - Present State and Perspective for New Applications	
B. Bundara, M. Tokuda and M. Ye	43
Vertical Seismic Prospecting System Using Super Elastic Alloy	
T. Inaba, N. Horiba, K. Yamauchi, A. Hirata and K. Kaneko	47
Directly Acting Pipeline SM Devices for Nuclear Power Plants	
R.R. Ionaitis	51
Medical Application of NiTi Shape Memory Alloy in China	
Y. Chu, K.R. Dai, M. Zhu and X.J. Mi	55
Medical Uses of Nitinol	
A.R. Pelton, D. Stöckel and T.W. Duerig	63
Orthodontic Applications of a Superelastic Shape-Memory Alloy Model	
R.W. Glendenning, J.A.A. Hood and R.L. Enlow	71
Physical Characterisation of Endodontic Instruments in NiTi Alloy	
L. Torrisi and G. Di Marco	75
Mechanical Compatibility Characterization of Shape Memory Mesh Stents	
X.J. Mi, M. Zhu, J.F. Guo, Y.M. Kou, F.H. Wang and G. Yuan	79
Smart Materials Based on Shape Memory Alloys: Examples from Europe	
R. Gotthardt, P. Scherrer and R. Stalmans	83
Researches of Smart Materials in Japan	
Y. Furuya and J. Tani	91
Intelligent Bearing System for Passing through Critical Speed of Aeroengine Rotor by Changing Stiffness Using SMA Wires	
J.X. Nie and X.J. Yan	99
Crystallography and Boundary Structure of Twins in Ti-Ni and Ti-Pd Martensites	
M. Nishida and S. Li	103
Effect of Pre-Deformation on Hysteresis in TiNiFe Shape Memory Alloys	
C.B. Jiang and H.B. Xu	111
Hydrostatic Pressure Dependence of Transformation Temperatures of Ti-Ni-Cu Alloys	
T. Fukuda, T. Kakeshita, N. Tamura, T. Saburi and S. Endo	115
Pseudo-Elasticity and Shape Memory Effect on the TiNiCoV Alloy	
S.E. Hsu, M.T. Yeh, I.C. Hsu, S.K. Chang, Y.C. Dai and J.Y. Wang	119
Fatigue Crack Growth Properties and Scanning Electron Microscopy of Fatigue Fracture Surface of a Ti-Ni-Co Shape Memory Alloy	
Y. Kishi, Z. Yajima, K. Shimizu and K. Morii	123
The Interface of Sputter-Deposited TiNi Thin Film on (100) Si Wafer	
S.K. Wu, J.Y. Wang, I.J. Wu and H.C. Lin	127
Amorphous-Crystalline Microstructures of Heat-Treated, Melt-Spun Ti₅₀Ni₂₅Cu₂₅ Ribbons	
P. Schlossmacher, H. Rösner, A.V. Shelyakov and A.M. Glezer	131

The Electrical Resistance of Ni₅₀Ti₃₀Hf₂₀ and Ni₅₀Ti_{40.5}Hf_{9.5} Melt-Spun Ribbons during Current-Driven Thermal Cycles	135
G. Airoldi, S. Piredda, M. Pozzi and A.V. Shelyakov	
Defect Modelling of Martensitic Transformations in NiTi	139
R.C. Pond and T. Nixon	
The Pseudoelasticity of a Ni₄₅Ti₅₀Cu₅ Alloy	143
T. Ranucci, S. Bessegini and G. Airoldi	
Effect of Alloying Elements Zr, Cr, V on Corrosion Behavior of Ti-Ni-Nb Shape Memory Alloy	147
Z.Z. Dong, D. Jia, Z. Tang, W.X. Liu and D.G. Wang	
Fatigue Properties of TiNi Shape Memory Alloy	151
H. Tobushi, T. Hashimoto, Y. Shimeno and K. Takata	
Constitutional Phases and Transformation Characteristics of Ni₄₁Ti₃₉Ta₂₀ Alloy	155
K.H. Wu, J.L. Ma and Z. Pu	
HREM Studies on the Microstructure of Severely Cold-Rolled TiNi Alloy after Reverse Martensitic Transformation	159
Y.F. Zheng, L.C. Zhao and H.Q. Ye	
Relation between {20-1} Twinning of B19' Martensitic and {114} Twinning of B2 Parent Phases in Ti-Ni Shape Memory Alloy	163
Y. Maruhashi, A. Ozaygen and M. Nishida	
Effect of Thermal Cycling and Aging on Microstructure in Near-Equatomic Ti-Pd Alloys	167
S. Ii, N. Matsuzaki, Y. Morizono and M. Nishida	
New Precipitate Phase in Pd and Ni Rich Ti-Pd-Ni Shape Memory Alloys	171
Y. Shirakawa, Y. Morizono and M. Nishida	
Effect of Ti Content on Nanometric Substructure and Shape Memory Property in Sputter-Deposited Ti-Rich Ti-Ni Thin Films	175
T. Matsunaga, S. Kajiwara, K. Ogawa, T. Kikuchi and S. Miyazaki	
Microstructure and Transformation Behavior of Ni₅₀Ti_{50-x}Ta_x Alloys	179
J.L. Ma, K.H. Wu and Z. Pu	
Creep Behavior of NiTi Shape Memory Alloys and the Effect of Pre-Creep on the Martensitic Phase Transformation	183
G.F. Eggeler, K. Neuking, A. Dlouhý and E. Kobus	
Study into the Influence of the Shape Setting Rate on Memory Effect Manifestation in Titanium Nickelide	187
N.N. Popov, N.D. Sevryugina, I.V. Sevryugin and N.V. Derkach	
Reversibility in Martensitic Transformation and Shape Memory in High Mn Ferrous Alloys	191
Y. Tomota and T. Maki	
Fe-Mn-Si Based Shape Memory Alloys	199
T.Y. Hsu	
Martensitic Transformation in Thin Foils of an Fe-Ni-Co-Ti Shape Memory Alloy	207
S. Morito, T. Moritani, T. Furuhara and T. Maki	
Mechanism of Improvement of Shape Memory Effect by Training in Fe-Mn-Si-Based Alloys	211
S. Kajiwara and K. Ogawa	
Continuous AFM Observation of Martensitic Transformation and Its Reversion in Training Cycles of Fe-Mn-Si Based Shape Memory Alloys	215
D.Z. Liu, T. Kikuchi, S. Kajiwara and N. Shinya	
Prediction of Martensitic Transformation Start Temperature M_s in Fe-Mn-Si Shape Memory Alloys	219
X.S. Jin and T.Y. Hsu	
Strengthening of Fe-Mn-Si Based Shape Memory Alloys by Grain Size Refinement	223
A. Sato, T. Masuya, M. Morishita, S. Kumai and A. Inoue	
Shape Memory Effect of Fe-17%Mn-X Alloys	227
S.H. Lee, H.J. Kim, J.H. Jun, S.H. Baik and C.S. Choi	
Influence of SME and Microstructure in FeMnSiCrNi SMA for Strengthening of Austenite Matrix	231
N. Gu, C.X. Lin, X.Y. Song, H. Peng, F. Yin and Q.S. Liu	
An ODF Analysis of Annealing Texture and Its Effect on SME in an Fe-Mn-Si-Cr Alloy Wire	235
B. Jiang, X. Qi, Y. Ren and C.M. Wang	

Shape Memory Behavior of an Fe-Mn-Si SMA Spring	239
J. Tang	
Characteristics of Fe-28Mn-6Si-5Cr Shape Memory Alloy Produced by Centrifugal Casting	243
H. Otsuka, T. Maruyama and H. Kubo	
The Welding Characteristics of Fe-Based Shape Memory Alloys	247
H.C. Lin, K.M. Lin, Y.C. Chuang, T.S. Chou and F.H. Chen	
Effect of Pre-Deformation Temperature on Reverse Transformation Characteristic in Fe-Mn-Si Based Alloys	251
D.G. Wang, X. Xing, J.M. Chen, Z.Z. Dong and W.X. Liu	
Atomic Force Microscopy Study of Stacking Modes of Martensitic Transformation in Fe-Mn-Si Based Shape Memory Alloys	255
D.Z. Liu, T. Kikuchi, S. Kajiwara and N. Shinya	
Effects of High Magnetic Field on Martensitic Transformation Behavior and Structure in Fe-Based Alloys	259
H. Ohtsuka, G. Ghosh and H. Wada	
Influence of Ausforming on Substructures and Shape Memory Behavior in Fe-28Mn-6Si-5Cr Alloy	263
D.G. Wang, W. Ji, M. Han, D. Jia and W.X. Liu	
Grain Size Effect on the Microstructure of Deformed Fe-Mn-Si Based Shape Memory Alloys	267
T. Masuya, N. Yoneyama, S. Kumai and A. Sato	
High Temperature Shape Memory Effect in Some Alloys and Compounds	271
Y.N. Koval	
Thermal Cyclic Characteristics under Load in a Ti_{50.6}Pd₃₀Ni_{19.4} Alloy	279
W. Cai, S. Tanaka and K. Otsuka	
Recrystallization of Ti₅₁Ni₁₃Pd₃₆ High Temperature Shape Memory Alloys	283
S.K. Gong, S. Hu and H.B. Xu	
Influence of Substitution of V for Ti on Martensitic Transformation of TiPd Alloy	287
K. Enami, K. Morota, M. Hisa and K. Inoue	
High-Temperature Cu-Al-Nb Shape Memory Alloys	291
H. Morawiec, J. Lel'tko, Y. Koval and V. Kolomotsev	
Fabrication, Microstructure and Stress Effects in Sputtered TiNi Thin Films	295
D.S. Grummon	
Structure of Sputter-Deposited Ti-Rich Ti-Ni Alloy Films	303
Y. Kawamura, A. Gyobu, T. Saburi and M. Asai	
The Ti-Ni-Me and Cu-Al-Me Melt-Spun Shape Memory Ribbons: Relation between the Microstructure and Functional Properties	307
V. Kolomotsev, A. Pasko, R. Portier, P. Ochin, A. Seerneels, W. Van Moorleghem, E. Cesari, C. Seguí and J. Van Humbeeck	
Microstructure and Functional Properties of the TiNi- and CuAl-Based SMA Thin Films and Coats Produced by PVD Technique	311
V. Kolomotsev, R.Y. Musienko, V. Nevdacha, V. Panarin, A. Pasko, R. Portier, P. Ochin, E. Cesari, C. Seguí and J. Van Humbeeck	
Interfacial Structure and the Shape Memory Effect	315
D.P. Dunne	
Transformation Thermomechanics of SMAs	323
K. Tanaka	
Shape Memory Alloys as Damping Materials	331
J. Van Humbeeck and Y. Liu	
The Hysteresis Expansion and the Relaxation of Elastic Energy in Thermoelastic Martensitic Transformations	339
X.Q. Zhao	
Thermomechanical Constitutive Modeling of Polyurethane-Series Shape Memory Polymer	343
H. Tobushi, N. Ito, K. Takata and S. Hayashi	
The Phase Field Model and Computer Simulation of Martensitic Transformation under Applied Stresses	347
A. Artemev and A.G. Khachaturyan	
Bending of Beams in Superelasticity Domain	351
F. Kosel and B. Bundara	

Study on Indirect Method for Determination of Compression Characteristics of SMA	355
B. Bundara, M. Tokuda and M. Ye	
On Formal Structure of Constitutive Equations for Materials Exhibiting Shape Memory Effects	359
I. Dobovšek	
Change in Young's Modulus Associated with Martensitic Transformation in Shape Memory Alloys	363
K.I. Sugimoto and M. Nakaniwa	
Landau Theory of the Displacive Phase Transformations in Gold-Cadmium and Titanium-Nickel Alloys	367
G.R. Barsch	
Asymmetric Behavior of Elastic Scattering Appearing Prior to the Transformation in Au-47.5at%Cd	377
T. Ohba, K. Sato and K. Otsuka	
Evolution of Lattice Vibration through Vortex into Change of Crystal Structure: A Path in the Martensitic Transformation	381
T. Suzuki, M. Shimono and S. Takeno	
Defect-Induced Microstructure and Shape Memory in a Continuum Model	385
A. Saxena, T. Lookman, S.R. Shenoy and A.R. Bishop	
Intrinsic Hysteresis of Superelastic Deformation	389
A.L. Roytburd	
The Effect of Specimen Size on the B2B19 Martensitic Transformation under Quasi-Static Condition in 49.5Ti-40Ni-10Cu-0.5Al(at%) Alloy	393
S. Onai and H. Sakamoto	
A Study of Martensitic Transformation in Au-51.5at%Cd Alloy	397
M. Inami, T. Ishii, X.B. Ren and K. Otsuka	
Bainitic Transformation of Au-47.5at%Cd Alloy	401
K. Ogawa, S. Yamada, X.B. Ren, T. Ishii, K. Otsuka and T. Ohba	
Observation on Plastic Accommodation of Shape Strain in Martensitic Transformation in Fe-Ni-C Shape Memory Alloys	405
D.Z. Liu, N. Bergeon, T. Kikuchi, S. Kajiwara and N. Shinya	
Facets of Nanometer-Sized Fe-Ni Alloy Particles and Their Change upon the Martensitic Transformation	409
K. Asaka, Y. Hirotsu and T. Tadaki	
Origin of the Annihilation Effect of Martensite Aging	413
X.B. Ren and K. Otsuka	
Surface Morphological Study of the Transformation Strain of Martensites and Bainites in Copper Alloys	417
K. Marukawa, I. Kumagai and K. Takezawa	
Pretransitional Effects in Martensitic Transformations	421
A. Planes and L. Mañosa	
Why Does the Martensitic Transformation Temperature Strongly Depend on Composition?	429
X.B. Ren and K. Otsuka	
Heterophase Fluctuation of ω-Phase Nucleation	433
H. Kubo	
Pre-Martensitic Phenomenon in NiTi Studied by Positron Lifetime Spectroscopy	437
H. Araki, N. Matake, P. Chalermkarnnon and Y. Shirai	
Observations on Diffuse Scattering in a Ti₅₀Ni₄₈Fe₂ Alloy by Energy-Filtering TEM	441
Y. Murakami, D. Shindo and K. Otsuka	
Precursors of Thermoelastic Fcc-Fct Martensite Transformation of Fe₃Pt Alloys	445
R. Oshima, S. Muto and M. Takahashi	
Lattice Instability for $\frac{1}{2}(110)[110]$ Wave in Shape Memory Alloys	449
Y. Nakata	
The Two Way Shape Memory Effect: Influence of Stabilization in Single and Polycrystals of Cu-Based Alloys	453
E. Cingolani, P.A. Laroche and M. Ahlers	
Stress and Aging Effects on the Transformation Characteristics in Au-Cd Alloys	457
T.R. Finlayson, G.L. Kelly, T. Ersez and T.F. Smith	

Monte Carlo Study of Atomic Ordering in Relation to the Rubber Effect and the Stabilization of Martensites	
K. Marukawa, S. Moteki and K. Tsuchiya	461
Effect of Aging on the Martensitic Transformation Temperature in Ag-Zn-Al Alloys	
K. Takezawa, H. Hoshi and K. Marukawa	465
Aging Response of Shape Memory Behavior in γ-MnCu Alloys	
K. Tsuchiya, O. Kawabata, M. Umemoto, H. Sato and K. Marukawa	469
Effect of Co Addition on the Ordering and Martensitic Transformations in Cu-Al-Mn Shape Memory Alloys	
Y. Sutou, R. Kainuma and K. Ishida	473
Superplastic Deformation and Shape Memory Effects of Cu-Zn-Sn Alloys	
H. Honda, R. Matubara, N. Ashie, K. Nakamura and S. Miura	477
Acoustic Emission at the Premartensitic and Martensitic Transitions of Ni₂MnGa Shape Memory Alloy	
L. Mañosa, L. Carrillo, E. Vives, E. Obradó, A. González-Comas and A. Planes	481
Martensitic Transformations in Ni-Mn-Ga System Affected by External Fields	
V.A. Chernenko, O. Babii, V.A. L'vov and P.G. McCormick	485
Properties of Ni₂MnGa Shape Memory Alloy Prepared by Spark Plasma Sintering	
Z. Wang, M. Matsumoto, S.T. Pantelides, K. Oikawa, J. Qiu, T. Takagi and J. Tani	489
Premartensitic States in the Ferromagnetic Ni-Mn-Ga Alloys	
V.V. Kokorin	493
NiAl Shape Memory Alloy by Powder Metallurgy Method	
C.H. Man and C.Y. Chung	497