

Contents

Foreword	v
<i>1. SOLID STATE REACTIONS</i>	
Crystal-to-glass transformation in metallic materials	1
W. L. Johnson (Pasadena, CA, U.S.A.)	
Formation of amorphous metals by mechanical alloying	15
L. Schultz (Erlangen, F.R.G.)	
Formation of amorphous Ni–Zr powders by mechanical alloying	25
F. Petzoldt, B. Scholz and H.-D. Kunze (Bremen, F.R.G.)	
Formation of powdered Hf–Ni, Hf–Cu and Hf–Ru materials by mechanical alloying methods	31
J. R. Thompson (Knoxville, TN, U.S.A.), C. Politis (Karlsruhe, F.R.G.) and Y. C. Kim (Knoxville, TN, U.S.A.)	
Amorphization of RFe ₂ Laves phases by hydrogen absorption	35
K. Aoki, A. Yanagitani, X.-G. Li and T. Masumoto (Sendai, Japan)	
Formation and properties of mechanically alloyed amorphous Fe–Zr	39
E. Hellstern and L. Schultz (Erlangen, F.R.G.)	
X-ray diffraction study of the amorphization process by mechanical alloying of the Ni–Ti system	43
G. Cocco (Sassari, Italy), S. Enzo (Venice Italy), L. Schifflini (Sassari, Italy) and L. Battezzati (Turin, Italy)	
New amorphous Cu–Nb–(Si, Ge or Sn) alloys prepared by mechanical alloying of elemental powders	47
K. Matsuki, A. Inoue, H. M. Kimura and T. Masumoto (Sendai, Japan)	
Mechanically alloyed amorphous metallic powders with second phase particles	53
H. Kimura (Yokosuka, Japan) and F. Takada (Tokyo, Japan)	
Structure analyses of amorphous melt-spun Fe–Zr–(B, Si) alloys and mechanically alloyed Fe–Zr powders	59
W. Biegel, H. U. Krebs, C. Michaelsen, H. C. Freyhardt (Göttingen, F.R.G.) and E. Hellstern (Erlangen, F.R.G.)	
Early stages of the solid state amorphization of crystalline layers	63
K. Samwer (Pasadena, CA, U.S.A.), H. Schroder (Göttingen, F.R.G.) and K. Pampus (Aarhus, Denmark)	
Formation of amorphous alloys by solid state reactions	71
R. B. Schwarz (Los Alamos, NM, U.S.A.)	
Determination of the free energy of equilibrium and metastable phases in the Cu–Zr system	79
R. Bormann, F. Gärtner and F. Haider (Göttingen, F.R.G.)	
A differential scanning calorimetry study of solid state amorphization in multilayer Ni/Zr	83
R. J. Highmore, R. E. Somekh, A. L. Greer and J. E. Evetts (Cambridge, U.K.)	
Solid state interdiffusion reactions of Ni/Zr diffusion couples	87
W. J. Meng, C. W. Nieh, E. Ma, B. Fultz and W. L. Johnson (Pasadena, CA, U.S.A.)	
Strain-driven solid state amorphization of binary transition metal alloys	93
A. Blatter and M. von Allmen (Bern, Switzerland)	
Ion irradiation during a solid state amorphization reaction	97
K. Pampus, J. Bøttiger, K. Dyrbye, B. Trop (Aarhus, Denmark) and K. Samwer (Göttingen, F.R.G.)	
Solid state amorphization in Ni/Ti multilayers	101
J. F. Jongste, M. A. Hollanders, B. J. Thijsse and E. J. Mittemeijer (Delft, The Netherlands)	
Rapid melting and quenching with microsecond current pulses	105
B. M. Clemens (Warren, MI, U.S.A.) and R. M. Gilgenbach (Ann Arbor, MI, U.S.A.)	
The solid state reaction in multilayers studied by X-ray absorption spectroscopy	109
C. Brouder, G. Krill (Vandoeuvre lès Nancy, France), E. Dartyge, A. Fontaine, G. Tourillon (Orsay, France), P. Guilmin and G. Marchal (Vandoeuvre lès Nancy, France)	
Study of the formation of the amorphous phase in metallic systems by mechanical alloying	115
R. Sundaresan, A. G. Jackson, S. Krishnamurthy and F. H. Froes (Dayton, OH, U.S.A.)	
Thermal properties of mechanically alloyed Ni ₅₀ Ti ₅₀ powders	121
L. Battezzati (Turin, Italy), G. Cocco, L. Schifflini (Sassari, Italy) and S. Enzo (Venice, Italy)	
Amorphization of cobalt-rich magnetic alloys by high energy ball milling	125
H. Kimura (Yokosuka, Japan), F. Takada (Tokyo, Japan) and W.-N. Myung (Yokosuka, Japan)	
Formation of amorphous phase by solid state reaction in elemental composites prepared by cold rolling	129
F. Bordeaux, A. R. Yavari and P. Desre (Saint-Martin-d'Hères, France)	
Amorphous transition metal–zirconium alloys prepared by milling	133
A. W. Weeber and H. Bakker (Amsterdam, The Netherlands)	

2. FORMATION AND STRUCTURE OF AMORPHOUS ALLOYS

Metastability of amorphous phases and its application to the consolidation of rapidly quenched powders	137
P. H. Shingu (Kyoto, Japan)	
On the operative mechanisms in the solidification of undercooled melts	143
K. S. Dubey, P. Ramachandrarao and S. Lele (Varanasi, India)	
Crystal nucleation and glass-forming ability of Cu–Zr in a containerless state.	147
F. Gillessen and D. M. Herlach (Köln, F.R.G.)	
Amorphous alloy powders with dispersed carbonitride particles prepared by high pressure nitrogen atomization	153
A. Inoue, T. Masumoto, T. Komura, D. Sun and M. Oguchi (Sendai, Japan)	
Large-angle neutron scattering studies of amorphous Fe_xTi_{1-x} alloys and hydrides	157
B. Rodmacq, F. Lançon, A. Chamberod and M. Maret (Grenoble, France)	
Phase separation in amorphous Zr–Fe alloys determined by anomalous X-ray scattering and magnetization measurements.	163
H. U. Krebs, W. Biegel (Göttingen, F.R.G.), A. Bienenstock (Menlo Park, CA, U.S.A.), D. J. Webb and T. H. Geballe (Stanford, CA, U.S.A.)	
The X-ray absorption near-edge structure (XANES) – a criterion for modelling the three-dimensional structure of amorphous $Fe_{80}B_{20}$	169
P. Kizler, P. Lamparter and S. Steeb (Stuttgart, F.R.G.)	
Irradiation-induced defects in amorphous $Fe_{40}Ni_{40}P_{20}$	173
F. P. Schimansky, R. Gerling and R. Wagner (Geesthacht, F.R.G.)	
Glass-forming conditions during laser surface melting	177
D. G. Morris (Neuchâtel, Switzerland)	
Rapidly quenched composite materials	181
J. Latuszkiewicz, P. G. Zieliński and A. Załuska (Warsaw, Poland)	
The effects of the softness of the interionic pair potential on the liquid–glass transition	187
S. K. Lai (Chung-Li, Taiwan)	
The glass temperatures of variously quenched Pd–Cu–Si glasses	191
H. W. Gronert (Duisburg, F.R.G.), F. Gillessen and D. M. Herlach (Köln, F.R.G.)	
Influence of heterogeneous nuclei on the solidification of $Pd_{77.5}Cu_6Si_{16.5}$ glassy alloy.	195
C. S. Kiminami (Campina Grande, Brazil)	
Solid–liquid interfacial energy of Pd–16.5at.%Si glasses	199
Y. Nishi, A. Igarashi, Y. Kubo, N. Ninomiya and K. Mikagi (Hiratsuka, Japan)	
Influence of cooling characteristics on glass formation of metallic systems.	203
R. Sellger, W. Löser (Dresden, G.D.R.) and G. Richter (Riesa, G.D.R.)	
Alloying effects on the processing and properties of melt spun nickel–metalloid ribbons.	207
R. P. I. Adler and S. C. Hsu (Waltham, MA, U.S.A.)	
On liquid–glass transitions of binary alloys	215
D. H. Li and S. Wang (Waterloo, Ontario, Canada)	
Electronic aspects of formation of metallic glasses	219
P. Hicter, C. Colinet and A. Pasturel (Saint-Martin-d'Hères, France)	
Changes in short-range order resulting from hydrogen absorption of Fe_2Ce and Fe_2Er metallic glasses	223
M. Matsuura (Miyagi, Japan), K. Fukamichi, H. Komatsu, K. Aoki, T. Masumoto and K. Suzuki (Sendai, Japan)	
Neutron and X-ray small-angle scattering with Fe-based metallic glasses	227
P. Lamparter, S. Steeb (Stuttgart, F.R.G.), D. M. Kroeger and S. Spooner (Oak Ridge, TN, U.S.A.)	
Measurements of the phonon density of states of amorphous $Ni_{0.95}Tb_{0.05}$	231
R. Fainchtein and J. S. Lannin (University Park, PA, U.S.A.)	

3. CRYSTALLIZATION OF AMORPHOUS ALLOYS

Surface crystallization of metallic glasses	233
U. Köster (Dortmund, F.R.G.)	
The local value of the Avrami exponent: a new approach to devitrification of glassy metallic ribbons	241
A. Calka and A. P. Radlinski (Canberra, Australia)	
Effects of ultrahigh pressure on the crystallization temperature of $Ni_{80}P_{20}$ amorphous alloys	247
T. Imura (Nagoya, Japan), M. Suwa (Ibaragi, Japan) and K. Fujii (Nagoya, Japan)	
The effect of picosecond laser treatment on the stability kinetics and the mode of crystallization of metallic glassy ribbons.	253
A. P. Radlinski, A. Calka and B. Luther-Davis (Canberra, Australia)	
Crystallization of amorphous metal matrix composites	259
W.-N. Myung, S. Yang (Kwang ju, Korea), H. Kimura (Yokosuka, Japan) and T. Masumoto (Sendai, Japan)	
Crystallization behavior of amorphous Fe–Mo alloys	265
J. H. Hsu, S. T. Chou, Y. D. Yao (Taipei, Taiwan), C. L. Chien and S. H. Liou (Baltimore, MD, U.S.A.)	

Preparation of refractory transition metal–metalloid amorphous alloys and their thermal stability	269
T. Yoshitake, Y. Kubo and H. Igarashi (Kanagawa, Japan)	
Structural model for commensurate and non-periodic carbides formed by crystallization of amorphous iron–carbon alloys.	273
E. Bauer Grosse and G. Le Caer (Nancy, France)	
Embrittlement of Ni–Ti–B glasses during crystallization	279
N. Merk, D. G. Morris and M. A. Morris (Neuchâtel, Switzerland)	
Crystal nucleation in glass-forming alloys.	285
A. L. Greer (Cambridge, U.K.)	
Measurement and interpretation of glass transition temperature T_g in a number of metallic systems	291
H. Baxi and T. B. Massalski (Pittsburgh, PA, U.S.A.)	
A new concept of effective temperature to correlate isothermal and anisothermal continuous temperature–time–transformation curves—application to crystallization of Fe–Ni–B amorphous alloys	297
Ch. Cunat (Hanau, F.R.G.)	
The glass transition, crystallization and melting in Au–Pb–Sb alloys.	301
M. C. Lee (Pasadena, CA, U.S.A.), H. J. Fecht (Madison, WI, U.S.A.), J. L. Allen (Pasadena, CA, U.S.A.), J. H. Perepezko, K. Ohsaka (Madison, WI, U.S.A.) and W. L. Johnson (Pasadena, CA, U.S.A.)	
Crystallization of amorphous NiZr ₂	307
M. Sutton, Y. S. Yang, J. Mainville, J. O. Ström-Olsen, Z. Altounian (Montreal, Canada), G. B. Stephenson and K. F. Ludwig, Jr. (Yorktown Heights, NY, U.S.A.)	
Transient nucleation in zirconium-based metallic glasses	313
M. Blank-Bewersdorff and U. Köster (Dortmund, F.R.G.)	
A comparison between the thermal properties of Ni–Zr amorphous alloys obtained by mechanical alloying and melt-spinning.	317
R. Brüning, Z. Altounian, J. O. Ström-Olsen (Montreal, Canada) and L. Shultz (Erlangen, F.R.G.)	
A study of thermal relaxation and crystallization of an Fe ₈₁ B _{13.5} Si _{3.5} C ₂ amorphous ribbon	321
P. K. Roy, K. P. Gupta and D. C. Agrawal (Kanpur, India)	
Compositional correlations in the crystallization of iron–transition-metal–boron glasses	325
J. A. Leake and J. E. Rout (Cambridge, U.K.)	
An X-ray diffraction study of the crystallization characteristics of amorphous Co–B ribbons.	329
G.-H. Tu and W.-R. Chen (Nanjing, China)	
The crystallization process of Ni ₇₈ Si ₈ B ₁₄ amorphous alloys.	333
M. D. Baró (Bellaterra, Spain), N. Clavaguera (Barcelona, Spain) and S. Suriñach (Bellaterra, Spain)	
Crystallization kinetics of Co _{88-x} Fe _x B ₂₀ amorphous alloys.	337
P. Duhai, P. Švec, M. Durečeková and G. Ulasák (Bratislava, Czechoslovakia)	
Crystallization of Ni–B metallic glasses with high boron contents	343
B. Punge-Witteler and U. Köster (Dortmund, F.R.G.)	
Differences in crystallization of Fe–Ni-based metallic glasses caused by changes in heating conditions.	347
A. Załuska and H. Matyja (Warsaw, Poland)	
Crystallization of amorphous Cu–Ni–P alloys.	351
R. Adlwarth, H. Selke and P. L. Ryder (Bremen, F.R.G.)	
Crystallization of some iron-based metallic glasses	355
T. Nagarajan, U. Chidambaram Asari, S. Srinivasan, V. Sridharan and A. Narayansamy (Madras, India)	
Influence of copper additions on the crystallization of amorphous Fe–Bi–Si alloys	361
S. Budurov, T. Spassov (Sofia, Bulgaria), G. Stephani, S. Roth and M. Reibold (Dresden, G.D.R.)	
Crystallization and nucleation mechanisms in well-prepared Ni–Si–B glass	365
M.-H. Zuercher and D. G. Morris (Neuchâtel, Switzerland)	
Depth profile of the crystallization of Fe ₈₀ B ₂₀ metallic glass.	369
P. Tlomag, S. J. Pierz, L. J. Paulson and W. E. Brower, Jr. (Carbondale, IL, U.S.A.)	
A comparative study of the thermal stabilities and crystallization processes of amorphous Zr _{0.67} TM _{0.33-x} M _x alloys with TM ≡ Co or Ni, M ≡ P or Si and 0.00 ≤ x ≤ 0.12 by differential scanning calorimetry and X-ray diffraction techniques	373
K. Jansson and M. Nygren (Stockholm, Sweden)	
Formation and crystallization of amorphous phases in the Ti–Be–Al system.	379
L. E. Tanner (Livermore, CA, U.S.A.), L. A. Jacobson (Los Alamos, NM, U.S.A.) and M. E. Wall (Livermore, CA, U.S.A.)	
Characterization and kinetics of the crystallization of Al–Ni–Si amorphous alloys.	385
J. M. Legresy, M. Audier and P. Guyot (Saint-Martin-d’Heres, France)	
Neutron diffraction study of the crystallization of hydrogenated Cu–Ti amorphous alloys	391
B. Rodmacq (Grenoble, France), Ph. Goudeau (Poitiers, France), J. Pannetier and A. Chamberod (Grenoble, France)	

The relation between the temperatures of incipient crystallization of the Fe–Si–B amorphous alloys and metal–metalloid bonds	395
H. Wang and S. Zhang (Shenyang, China)	
Relationship between crystallization temperature and pre-existing nuclei in amorphous Ni–P alloys	399
K. Lu and J. T. Wang (Shenyang, China)	
4. RELAXATION AND DIFFUSION PHENOMENA IN AMORPHOUS ALLOYS	
Interdiffusion in amorphous metallic artificial multilayers	403
F. Spaepen (Cambridge, MA, U.S.A.)	
Tracer diffusion in amorphous alloys	409
J. Horváth, J. Ott, K. Pfahler and W. Ulfert (Stuttgart, F.R.G.)	
Diffusion mechanisms in amorphous alloys	415
W. Frank, J. Horváth and K. Kronmüller (Stuttgart, F.R.G.)	
Host and hydrogen diffusion in an Ni–Zr metallic glass	419
B. S. Berry and W. C. Pritchett (Yorktown Heights, NY, U.S.A.)	
Proton and deuteron NMR in amorphous TiCuD_x	427
M. P. Volz, V. P. Bork, P. A. Fedders, R. E. Norberg (St. Louis, MO, U.S.A.), R. C. Bowman, Jr. (Los Angeles, CA, U.S.A.), A. J. Maeland (Morristown, NJ, U.S.A.) and J. S. Cantrell (Oxford, OH, U.S.A.)	
Nuclear magnetic resonance studies of diffusion of hydrogen in amorphous alloys of the type Ni–Zr–P	431
H. E. Schone, H. C. Hoke, A. Johnson (Williamsburg, VA, U.S.A.), I. Bakonyi, K. Tompa and A. Lovas (Budapest, Hungary)	
Diffusivity of hydrogen in amorphous $\text{Ni}_{81}\text{P}_{19}$ and $\text{Ni}_{70}\text{Cr}_{6.7}\text{Fe}_{2.5}\text{Si}_{8.0}\text{B}_{12.8}$ alloys	437
Y. Sakamoto, K. Takao and K. Baba (Nagasaki, Japan)	
Topological ordering in model metallic glasses	441
K. Maeda, Y. Mera, S. Kobayashi and S. Takeuchi (Tokyo, Japan)	
Viscosity and structural relaxation in $\text{Pd}_{40}\text{Ni}_{40}\text{P}_{19}\text{Si}_1$	449
C. A. Volkert and F. Spaepen (Cambridge, MA, U.S.A.)	
Comparison of damping measurement and differential scanning calorimetry as methods of determining the glass transition temperature in metallic glasses	453
H.-R. Sinning and F. Haessner (Braunschweig, F.R.G.)	
Evidence for recovery of ductility in an embrittled Fe–B–Si metallic glass	457
C. J. Small and H. A. Davis (Sheffield, U.K.)	
Reversible structural relaxation in metallic glasses	461
Z. Altounian (Montreal, Canada)	
Gaussian activation energy spectra in reversible and irreversible structural relaxation	469
J. A. Leake, E. Woldt and J. E. Evetts (Cambridge, U.K.)	
Structural relaxation of e^- -irradiated amorphous alloys by tunnelling and thermally activated processes	473
H. Kronmüller, N. Moser, A. Hofmann and W. Gehring (Stuttgart, F.R.G.)	
Viscous flow in amorphous $\text{Fe}_{78}\text{B}_{13}\text{Si}_9$ alloy	479
A. R. Bhatti and B. Cantor (Oxford, U.K.)	
Viscous flow of amorphous alloys under compressive and tensile stresses	483
J.-T. Wang, B.-Z. Ding, D. Pang, S.-L. Li and G.-S. Li (Shenyang, China)	
Viscous flow behaviour of the metallic glass $\text{Ni}_{30}\text{Zr}_{70}$ under continuous heating	487
F.-Q. Zheng (Yunnan, China)	
Viscoplastic properties of an Fe–Cr–P–C amorphous alloys	493
A. Bouali and C. Tete (Nancy, France)	
Relaxation parameters to simulate the changes in magnetostriction in amorphous magnetic alloys	497
Ch. Cunat, H. R. Hilzinger and G. Herzer (Hanau, F.R.G.)	
Low temperature internal friction peaks and thermoelastic damping in $\text{Ni}_{78}\text{Si}_8\text{B}_{14}$ and CoZr_2 metallic glasses	501
H.-R. Sinning, E. Woldt and F. Haessner (Braunschweig, F.R.G.)	
Resistivity changes during structural relaxation of amorphous $\text{Fe}_{40}\text{Ni}_{40}\text{B}_{20}$	505
E. Kokmeijer, E. Huizer, B. J. Thijssen and A. van der Beukel (Delft, The Netherlands)	
The influence of quenching rate on the relaxation processes in a nearly non-magnetostrictive metallic glass	509
T. Tarnóczy, A. Lovas and C. Kopasz (Budapest, Hungary)	
Evidence for chemical decomposition of amorphous $\text{Fe}_{40}\text{Ni}_{40}\text{P}_{20}$ —an investigation by means of small-angle neutron scattering	515
R. Gerling, F. P. Schimansky and R. Wagner (Geesthacht, F.R.G.)	
Influence of the induced anisotropy on the magnetic after-effect in amorphous $\text{Co}_{58}\text{Ni}_{10}\text{Fe}_5\text{Si}_{11}\text{B}_{16}$ alloy	519
H.-Q. Guo (Beijing, China), H. Kronmüller and N. Moser (Stuttgart, F.R.G.)	
Structural relaxation in Pd–Ge metallic glass	523
J. R. Cost (Los Alamos, NM, U.S.A.), J. T. Stanley (Tempe, AZ, U.S.A.) and B. J. Thijssen (Delft, The Netherlands)	

A new method for measuring magnetic after-effect	529
Q. Wang and K.-Y. Ho (Sheyang, China)	
Measurements of structural relaxation in amorphous $\text{Fe}_{40}\text{Ni}_{40}\text{B}_{40}$ by differential scanning calorimetry.	533
S. Suriñach (Bellaterra, Spain), N. Clavaguera (Barcelona, Spain) and M. D. Baró (Bellaterra, Spain)	
Kinetic analysis of structural relaxation in FeNiCrPB amorphous alloys by electrical resistivity measurements.	537
M. Baricco, G. Riontino, P. Allia and F. Vinai (Torino, Italy)	
Anelastic relaxation in amorphous $\text{Pd}_{39.5}\text{Ni}_{39.5}\text{P}_{21}$	541
P. M. Bronsveld, J. Groote Schaarsberg, J. Nauta and J. Th. M. de Hosson (Groningen, The Netherlands)	
An algorithm to calculate activation energy spectra for structural relaxation in amorphous alloys	545
W. de Ceuninck, R. Zhao, G. Knuyt, L. de Schepper and L. M. Stals (Diepenbeek, Belgium)	
AUTHOR INDEX	549
A Cumulative Subject Index covering Volumes 97–99 will appear in Volume 99.	