

Subject Index

A

- Acoustic wave microsensors, 153, 154(figs), 155(table)
- Activation energy, glassy polymers, 255
- Aging, physical, nature of glass transition, 17
- Alkali borate, 185
- Alkali thioborate, 185
- Amorphous materials, 1(overview)
- Amorphous phase, glass transition, 17
- Analytical techniques, glass transition in polymers, 75, 174, 202, 211(table)
- Assignment of glass transition temperatures, 13-16, 75, 137
- ASTM Standards
 - D 83, 13
 - D 695, 281
 - D 3418, 13, 228
 - D 4065, 13, 90
 - D 4092, 13, 90
 - E 37, 13
 - E 375, 13
 - E 831, 76
 - E 1142, 13
 - E 1356, 1, 13, 76, 228
 - E 1363, 81, 82
 - E 1545, 1
- Automotive coatings, 293, 295(table)

B

- Biaxial orientation, poly(ethylene terephthalate)(PET), 239
- Blocks, 50
- Borate, inorganic glasses, thermal properties, 185

C

- Calorimetric studies, glass transition phenomena, 120
- Calorimetry, glass transition of ionomers, 214

- Carbon/epoxy composites, 277, 283(table), 285(table), 288-289(tables)
- Chalcogenide, inorganic glasses, thermal properties, 185
- Coatings, automotive, 293, 295(table)
- Composition and behavior of polymeric materials, glass transition measurement, 50
- Compressive mode, poly(ethylene terephthalate)(PET), 239
- Condensed moisture, discussion, 4
- Cooling exotherm, 137
- Cooling rate, 137
- Copolyester, 202
- Crosslinking, 88
- Crystallinity, 88
- Cure, elastomer systems, 226

D

- Dielectric properties, 108
- Dielectric relaxation, 32
- Dielectric thermal analysis for glass transition temperatures, 108
- Differential scanning calorimetry (DSC), assignment of glass transition temperatures
 - automotive coatings, 293, 295(table)
 - elastomer systems, 226
 - epoxy composites, 277, 283(table), 285(table), 288-289(tables)
 - instrumentation, 175(fig)
 - inorganic glasses, 185
 - liquid crystal polymer, 202
 - measurement, 50, 75, 120, 174, 226
 - oriented poly(ethylene terephthalate), 239
 - overview) 1
 - polymers, 174
 - structural relaxation process, 32
 - thermal curves, 137
- DSC. *See* Differential scanning calorimetry.
- Dynamic elastic storage modulus, 255
- Dynamic mechanical analysis for T_g automotive coatings, 293, 295(table)

determination in polymers, 88
 elastomer systems, 226
 glassy polymers, 255
 liquid crystal, 202
 toughened epoxy composites, 277,
 283(table), 285(table), 288-
 289(tables)

E

Elastomers, measurement of glass transition temperature, 226, 230(table), 232(table)
 Epoxies, 108
 Epoxy composites, 277, 283(table), 285(table), 288-289(tables)
 Ethylene-propylene-diene monomer (EPDM), measuring glass transition temperature, 269, 273-274(tables)

F

Fiber orientation effects, toughened epoxy composites, 277, 283(table), 285(table), 288-289(tables)
 Fictive temperature, 32, 50, 120, 137
 Flexural plate wave (FPW), 153
 Frequency effects, 255, 277, 283(table), 285(table), 288-289(tables)

G

Gases, high pressure, polystyrene plasticization, 165, 170(table)
 Germanate, inorganic glasses, thermal properties, 185
 Glass transition, 17, 50, 239
 Glass transition region, time dependencies, 32
 Glass transition phenomena, calorimetric studies, 120
 Glass transition temperature, T_g
 acoustic wave microsensors, 153
 assignment of values, 13-16
 assignment of values, using thermo-mechanical analysis, 75, 137
 automotive coatings, 293, 295(table)
 calorimetric studies, 120
 definitions, discussion, 13-16, 32, depression, 165
 determination by dynamic mechanical methods, 88
 determination by thermal analysis, 17

dielectric analysis, 108
 differential scanning calorimetry, 137, 174
 DSC thermal curves, 137
 effects of moisture, discussion, 4
 epoxy composites, 277, 283(table), 285(table), 288-289(tables)
 ethylene-propylene-diene-monomer (EPDM), comparison of measurement techniques, 269, 273-274(tables)
 glassy polymers, 255
 inorganic glasses, 185
 ionomers, 214, 216(table)
 liquid crystal polymer, 202
 measurements by DSC, 50, 174
 measurements, comparative, 174, 234-236(tables), 269, 273-274(tables), 273-274(tables), 293, 295(table)
 measurements, discussion, 6, summary, 302
 measurements in elastomer systems, 226, 234-236(tables)
 oriented poly(ethylene terephthalate), 239
 phenomenology of structural relaxation process, 32
 poly(ethylene terephthalate), 239
 polymeric materials, 50, 137, 174
 polystyrene plasticization, 165
 stress relaxation, 32
 structural relaxation, 32, 44(table)
 temperature dependence, 32
 thermal curves (DSC), 137
 thermomechanical, 174
 thermo-optical, 174
 thin polymer films, 153
 toughened epoxy composites, 277, 283(table), 285(table), 288-289(tables)
 Glasses, inorganic, transition and heat capacities, 185
 Glassy polymers, 255
 Grafts, 50

H

Halide, inorganic glasses, thermal properties, 185
 Heat capacity
 carbon, 127(figs)
 inorganic glasses, 185
 polyethylene, 29(fig)
 Heat/cool rate (DSC), 137
 Heat-flow calorimeter, 165

Heating rate (DSC), 137
 High-pressure calorimetry, 165, 167(fig)
 Hot state, 174
 Hysteresis, nature of glass transition, 17,
 23(fig)

I

Inorganic glasses, thermal properties,
 185, 197(table)
 Instrumental factors, T_g, 88
 Instruments, thermomechanical analyzer,
 77-78(figs)
 Ionic domains, 214
 Ionomers, glass transition, 214,
 216(table)

L

Linear thermodilatometry, 75
 Linear viscoelastic test methods, 88
 Liquid crystal polymer, glass transition,
 202
 Liquid, nature of glass transition, 17
 Loss factor, 108, 113(fig), 115(fig)

M

Measurement of glass transition
 temperature
 comparative methods, 174, 234-
 236(tables), 269, 273-274(tables),
 273-274(tables), 293, 295(table)
 dielectric analysis, 108
 differential scanning calorimetry, 174
 thermomechanical analysis, 174
 thermo-optical analysis, 174
 Measurement of temperature, 6, 137
 Mechanical relaxation, glass transition
 of ionomers, 214
 Mechanical testing, toughened epoxy
 composites, 277, 283(table),
 285(table), 288-289(tables)
 Mesophase
 liquid crystal polymer, 202
 nature of glass transition, 17
 Metal substrate, 293, 295(table)
 Microsensors, acoustic wave, in thin
 polymer films, 153
 Microphase separation, nature of glass
 transition, 17, 214
 Mobile amorphous phase, glass
 transition, 17, 239

Moisture, T_g determination in polymers,
 88
 Moisture, condensed, discussion, 4

N

Nanophase, nature of glass transition, 17

O

Onset temperature, 137
 Operational definition, 17

P

Peak temperature, 137
 Penetrometry, 75
 Permittivity, 108, 113(fig), 115(fig)
 Phosphate, inorganic glasses, thermal
 properties, 185
 Physical aging, 50
 Plasticization effect of dissolved gas,
 165
 Plasticizers, 50, 165
 Polycarbonate, 255
 Poly(ethylene terephthalate)(PET), glass
 transition temperatures, 174,
 180(table), 239, 240(table),
 242(table), 246(table), 249(table)
 Polymer-based materials, glass transition
 temperatures
 acoustic wave microsensors, 153
 blends, glass transition measurements
 by DSC, 50
 dielectric analysis, 108
 differential scanning calorimetry, 50,
 174

DSC thermal curves, 137
 elastomer systems, 226
 glass transition, discussion, 4
 glassy polymers, 255
 heat capacity, 29(fig)
 ionomers, 214
 measurement systems, comparison,
 179(table)
 mechanical methods for T_g
 determination, 88
 polystyrene plasticization, 165
 T_g measurements by DSC, 50, 88
 temperature measurement, discussion, 6
 thermodynamic transition, 50
 thermomechanical analysis, 174
 thermo-optical analysis, 174
 thin films, 153
 transition behaviors, 153

Polymer gas interactions, 165
 Polymer plasticization, 165
 Polystyrene(PS), 165, 174, 255
 Poly(vinyl acetate), 255
 Polyvinylchloride, 108, 255

R

Relaxation properties, thin polymer films, 153
 Residual entropies of glasses, 120, 124(table)
 Rigid amorphous phase, glass transition, 17, 50, 239
 Roofing materials, mechanical testing, 269

S

Salt groups, in relation to glass transition of ionomers, 214
 Semicrystalline materials, 1(overview)
 SH-APM. *See* Shear horizontal acoustic plate mode.
 Shear horizontal acoustic plate mode (SH-APM), 153
 Silicate glasses, thermal properties, 185
 Simultaneous differential scanning calorimetry, 174
 Softening temperature (,), 75, 239
 Solid, nature of glass transition, 17
 Strain, nature of glass transition, 17, 24(fig)
 Stress relaxation, 32
 Structural relaxation process, 32
 Surface acoustic wave (SAW), 153

T

T_g criterion, instrumental factors, 88
 T_g , glass transition temperature, 32
 T_g^f , softening temperature, 75
 Temperature calibration, 75
 Temperature dependence of macroscopic properties in glass transition region, 32
 Temperature measurement assigned glass transition discussion, 6
 Tensile mode, poly(ethylene terephthalate), (PET), 239
 Thermal analytical techniques liquid crystal polymer, 202, 211(table) nature of glass transition, 17 overview, 1

T_g determination in polymers, 88, 202
 Thermal analysis, toughened epoxy composites, 277, 283(table), 285(table), 288-289(tables)
 Thermal curves (DSC), 137
 Thermal/mechanical history, T_g in polymers, 88
 Thermal properties, inorganic glasses, 185
 Thermoanalytical methods discussion, 4
 Thermodilatometry, 75
 Thermodynamic transition, time dependent, 50
 Thermomechanical analysis (TMA) assignment of glass transition temperatures, 75 automotive coatings, 293, 295(table) elastomer systems, 226, 234(table) epoxy composites, 277, 283(table), 285(table), 288-289(tables) in polymers, comparison of results, 174 liquid crystal polymer, 202 oriented poly(ethylene terephthalate), 239
 Thermo-optical analysis (TOA), 174, 175(fig)
 Thermoplastics, 88
 Thermosets, 88
 Thickness/shear mode (TSM), 153
 Thin polymer films, 153
 Thioborates, inorganic glasses, thermal properties, 185
 TMA. *See* Thermomechanical analysis.
 TOA. *See* Thermo-optical analysis.
 Transition behavior, thin polymer films, 153
 TSM. *See* Thickness-shear mode.

U

Ultrasonic, 153
 Uniaxial orientation, poly(ethylene terephthalate)(PET), 239
 Upper use temperature, 277, 283(table), 285(table), 288-289(tables)

V

Viscoelastic test methods, 88
 Viscosity, 32
 Vitreous state, 120
 Vulcanization, elastomer systems, 226