## **Publications of C. Austen Angell**

- A Technique for the Measurement of Diffusion Coefficients in Molten Salts, C. A. Angell and J. O'M. Bockris, J. Sci. Instrum., 35, 458-461 (1958).
- Self-Diffusion in Molten Salts: Cd in CdCl<sub>2</sub>-KCl, J. O'M. Bockris and C. A. Angell, *Electrochim. Acta*, 1, 308–17 (1959).
- Self-Diffusion and Electrical Conductance Measurements on Solutions of Cadmium in Molten Cadmium Chloride, C. A. Angell and J. W. Tomlinson, offprinted from *Discuss. Faraday Soc.*, No. 32 (1962).
- 4. Success of Free Volume Model for Transport in Fused Salts, C. A. Angell, *J. Phys. Chem.*, **68**, 218 (1964).
- 5. Free Volume Model for Transport in Fused Salts: Electrical Conductance in Glass-Forming Nitrate Melts, C. A. Angell, *J. Phys. Chem.*, **68**, 1917 (1964).
- A Test of Polarized Electrode Methods for the Study of Diffusion in Fused Salts, C. A. Angell and J. W. Tomlinson, Proceedings of the First Australian Conference held in Sydney, published as the Proceedings in Electrochemistry (1964).
- Diffusion-Conductance Relations and Free Volume in Molten Salts, C. A. Angell, J. Phys. Chem., 69, 399 (1965).
- 8. Electrical Conductance of Concentrated Aqueous Solutions and Molten Salts: Correlation Through Free Volume Transport Model, C. A. Angell, *J. Phys. Chem.*, **69**, 2137 (1965).
- 9. Electrical Conductivity of Fused Potassium Nitrate, C. A. Angell, *J. Electrochem. Soc.*, **112**, 956 (1965).
- 10. Effect of Pressure on the Electrical Conductance and Glass-Transition Temperature of Molten Nitrates, C. A. Angell, L. J. Pollard, and W. Strauss, *J. Chem. Phys.*, **43**, 2899–2900 (1965).
- Self-Diffusion in Molten Lead and Thallous Chlorides, C. A. Angell and J. W. Tomlinson, *Trans. Faraday Soc.*, 61, 2312 (1965).
- 12. Sulfate and Sulfate-Chloride Glasses, C. A. Angell, *J. Am. Ceram. Soc.*, **48**, 540 (1965).
- The Water Content of a Heat-Treatment Salt Bath, C. A. Angell, J. A. Corbett, and R. C. Gifkins, *J. Aust. Inst. Met.*, 10 (4), 335 (1965).
- A New Class of Molten Salt Mixtures. The Hydrated Dipositive Ion as Independent Cation Species, C. A. Angell, J. Electrochem. Soc., 112, 1224–27 (1965).
- 15. New Compounds of the Type Mg(H<sub>2</sub>O)<sub>6</sub>MCl<sub>4</sub> (M=Fe, Co, Cu, Zn), D. M. Gruen and C. A. Angell, *Inorg. Nucl. Chem. Lett.*, **2**, 75 (1966).
- Simple Two-Dimensional Magnetic Disk Models of Ionic Liquids, C. A. Angell and D. M. Gruen, *J. Chem. Educ.*, 43, 194 (1966).
- 17. Short Range Order in Fused Salts. I. Coordination States of Nickel(II) in Molten Zinc Chloride-Potassium Chloride Mixtures, C. A. Angell and D. M. Gruen, *J. Phys. Chem.*, **70**, 1601 (1966).
- 18. On the Importance of the Metastable Liquid State and Glass Transition Phenomenon to Transport and Structure Studies in Ionic Liquids. I. Transport Properties, C. A. Angell, *J. Phys. Chem.*, **70**, 2793 (1966).

- 19. Octahedral-Tetrahedral Coordination Equilibria of Ni(II) and Cu(II) in Concentrated Aqueous Electrolyte Solutions, C. A. Angell and D. M. Gruen, *J. Am. Chem. Soc.*, **88**, 5192 (1966).
- Free Volume-Entropy Interpretation of the Electrical Conductance of Aqueous Electrolyte Solutions in the Concentrated Range 2–20 N, C. A. Angell, *J. Phys. Chem.*, 70, 3988 (1966).
- 21. Viscous Flow and Electrical Conductance in Ionic Liquids: Temperature and Composition Dependence in the Light of the Zero Mobility Concept, C. A. Angell, *J. Chem. Phys.*, **46**, 4673 (1967).
- Concentrated Electrolyte Solution Transport Theory: Directly Measured Glass Temperatures and Vitreous Ice.
   C. A. Angell, E. J. Sare, and R. D. Bressel. *J. Phys. Chem.*, 71, 2759 (1967).
- Fundamental Limitations on the Low-Temperature Operation of Electrolytic Devices, C. A. Angell, *J. Electrochem. Soc.*, 114, 1033 (1967).
- Octahedral and Tetrahedral Coordination States of Cobalt(II) in Molten Zinc Chloride-Aluminum Chloride Mixtures, C. A. Angell and D. M. Gruen, *Inorg. Nucl. Chem.*, 29, 2243 (1967).
- Oxide Glasses in the Light of the Ideal Glass Concept. I. General Aspects: Ideal and Non-Ideal Transitions, C. A. Angell, J. Am. Ceram. Soc., 51, 117–124 (1968).
- Oxide Glasses in the Light of the Ideal Glass Concept. II.
   Some Interpretations by Reference to Simple Ionic Glass Behavior, C. A. Angell, J. Am. Ceram. Soc., 51, 124 (1968).
- 27. Liquid—Liquid Immiscibility in Common Aqueous Salt Solutions at Low Temperatures, C. A. Angell and E. J. Sare, *J. Chem. Phys.*, **49** (10), 4713 (1968).
- 28. Transport in Molten Salts Under Pressure. I. Glass-Forming Nitrate Melts, C. A. Angell, L. J. Pollard, and W. Strauss, *J. Chem. Phys.*, **50**, 2694 (1969).
- Transport in Low-melting Molten Salt Systems, in *Molten Salts; Characterization and Analysis*, C. A. Angell and C. T. Moynihan, Ed. G. Mamantov, Marcel Dekker: New York, June 1969, p 315.
- Conductance, Viscosity, Density, PMR Spectra, and Glass Transition Temperatures of Calcium Nitrate Tetrahydrate--Cadium Nitrate Tetrahydrate Melts...An Ideal Fused Salt System, C. T. Moynihan, C. R. Smalley, C. A. Angell, and E. J. Sare, *J. Phys. Chem.*, 73 (6), 2287 (1969).
- Far Infrared Spectra of Inorganic Nitrate and Chloride Glasses, Liquids and Crystals: Complex Ions or Optical Phonons? C. A. Angell and J. Wong, *J. Chem. Phys.*, 51, 4519 (1969).
- 32. Glass-Forming Composition Regions and Glass Transition Temperatures for Aqueous Electrolyte Solutions, C. A. Angell and E. J. Sare, *J. Chem. Phys.*, **52**, 1058 (1970).
- 33. Mass Transport in Ionic Melts at Low Temperatures. Chronopotentiometric Diffusion Coefficients at Ag(I), Cd(II) and T1(I) in Calcium Nitrate Tetrahydrate, C. T. Moynihan and C. A. Angell, *J. Phys. Chem.*, **74**, 736 (1970).

- 35. Electrical Conductance of Ionic Liquids with Water Contents in the Range 0-80 mol %, C. A. Angell, *Aust. J. Chem.*, **23**, 929 (1970).
- Structure and Glass Transition Thermodynamics of Liquid Zinc Chloride from Far Infrared, Raman, and Probe Ion Electronic and Vibrational Spectra, C. A. Angell and J. Wong, *J. Chem. Phys.*, 53, 2053 (1970).
- 37. The Data Gap in Solution Chemistry, and the 'Ideal' Glass Transition Puzzle, C. A. Angell, *J. Chem. Educ.*, **47**, 583 (1970).
- Application of Spectroscopy in the Study of Glassy Solids.
   I. X-ray Spectroscopy, X-ray Absorption Fine Structure,
   U.V. Spectra and Visible Region Spectral Studies, J.
   Wong and C. A. Angell, Rev. Appl. Spec., 4 (1), 97–154 (1970).
- Applications of Spectroscopy in the Study of Glassy Solids. II. Vibrational Spectra, EPR and NMR Spectra, J. Wong and C. A. Angell, *Rev. Appl. Spec.*, 4 (2), 155–232 (1970).
- Phase Equilibria, Electrical Conductance and Density in the Glass-Forming System ZnCl<sub>2</sub> + Pyridinium Chloride: A Detailed Low-Temperature Analogue of the SiO<sub>2</sub> + Na<sub>2</sub>O System, A. J. Easteal and C. A. Angell, J. Phys. Chem., 74, 3987 (1970).
- Glass Transitions in Molecular Liquids. I. Influence of Proton-Transfer Processes in Hydrazine-Based Solutions, E. J. Sutter and C. A. Angell, *J. Phys. Chem.*, 75, 1826 (1971).
- Corresponding States and the Glass Transition for Alkali Metal Nitrates, C. A. Angell and D. B. Helphrey, J. Phys. Chem., 75, 2306 (1971).
- 43. Thermodynamic and Relaxational Aspects of the Glass Transition from a 'Bond Lattice' Model, K. J. Rao and C. A. Angell, contribution to *Amorphous Solids*, Eds. R. W. Douglas and D. Ellis, Wiley and Sons (1971), Proceedings Book Third International Conference (Sheffield 1970) on Physics of Non-Crystalline Solids.
- Conductivity and Dielectric Relaxation in Concentrated Aqueous Lithium Chloride Solutions, C. T. Moynihan, R. D. Bressel, and C. A. Angell, *J. Chem. Phys.*, 55, 4414 (1971).
- 45. Two-State Thermodynamics and Transport Properties for Water from Bond Lattice Model, C. A. Angell, *J. Phys. Chem.*, **75**, 3698 (1971).
- 46. Fused Salts, C. A. Angell, invited review for *Ann. Rev. Phys. Chem.*, **22**, 429 (1971).
- Spectroscopic Detection of the Glass Transition: the n→p\*
   Transition in Nitrate Melts, J. Wong and C. A. Angell,
   J. Non-Cryst. Solids, 7, 109 (1972).
- 48. Viscosity of Molten ZnCl<sub>2</sub> and Supercritical Behavior in its Binary Solutions, A. J. Easteal and C. A. Angell, *J. Chem. Phys.*, **56**, 4231 (1972).
- Protonic Semiconducting Glasses from Aqueous Solutions, C. A. Angell, R. D. Bressel, and P. M. Gammel, *J. Non-Cryst. Solids*, 7, 295 (1972).
- Configurational Excitations in Condensed Matter and the Bond Lattice Model for the Liquid-Glass Transition, C. A. Angell and K. J. Rao, *J. Chem. Phys.*, 57, 470–481 (1972).
- 51. Electrical Conductance in Supercritical Isobutyric Acid-Water Solutions, P. M. Gammel and C. A. Angell, *Phys. Lett. A*, **40A**, 49 (1972).

- 52. Self-Diffusion of Ag<sup>+</sup> and Na<sup>+</sup> in Molten Ca(NO<sub>3</sub>)<sub>2</sub> KNO<sub>3</sub>, B. J. Welch and C. A. Angell, *Aust. J. Chem.*, **25**, 1613 (1972).
- 53. Fluidity and Conductance in Aqueous Electrolyte Solutions: An Approach from the Glassy State and the High Concentration Limit. I. Ca(NO<sub>3</sub>)<sub>2</sub> Solutions, C. A. Angell and R. D. Bressel, *J. Phys. Chem.*, 76, 3244 (1972).
- Transport in Ionic Liquids Under Pressure. II. Concentrated Calcium Nitrate - Water and Magnesium Chloride -Water Solution, C. A. Angell, L. J. Pollard, and W. Strauss, J. Solution Chem., 1, 516 (1972).
- Spectroscopic Probing of Anion Environment in Inorganic Nitrate Glasses, J. Wong and C. A. Angell, *J. Non-Cryst. Solids*, 11, 402 (1973).
- Pressure Effects on the Far Infrared Spectra of Nitrate Glasses, J. Wong and C. A. Angell, *Chem. Phys. Lett.*, 18, 221 (1973).
- Glass-Forming Composition Regions and Glass Transition Temperature in Non-Aqueous Electrolyte Solutions, E. J. Sare and C. A. Angell, *J. Solution Chem.*, 2, 53 (1973).
- Diamond Cell Study of Pressure-Induced Coordination Changes for Ni(II) in Liquid Chloride Solvents, C. A. Angell and M. L. Abkemeier, *Inorg. Chem.*, 12, 1462 (1973).
- Thermodynamic Properties of M(I) M(II) Mixed Nitrate Glasses and Supercooled Liquids, K. J. Rao, C. A. Angell, and D. B. Helphrey, *Phys. Chem. Glasses*, 14, 26 (1973).
- Proton Magnetic Resonance Chemical Shifts and the Hydrogen Bond in Concentrated Aqueous Electrolyte Solutions, E. J. Sare, C. T. Moynihan, and C. A. Angell, J. Phys. Chem., 77, 1869 (1973).
- 61. Anomalous Heat Capacities of Supercooled Water and D<sub>2</sub>O, D. H. Rasmussen, A. P. Mackenzie, J. C. Tucker, and C. A. Angell, *Science*, **181**, 4079 (1973).
- Glass Transition with Negative Change in Expansion Coefficient, E. Williams and C. A. Angell, *J. Polym. Sci.*, *Polym. Lett.*, 11, 383 (1973).
- A Novel Electrolyte System: Solutions of Diethyl Ether in Concentrated Aqueous HCl + ZnCl<sub>2</sub> Mixtures, A. J. Easteal and C. A. Angell, *J. Electrochem. Soc.*, 120, 1143 (1973).
- 64. Anomalous Properties of Supercooled Water: Heat Capacity. Expansivity. and PMR Chemical Shift from 0 to 38 °C, C. A. Angell, J. Shuppert, and J. C. Tucker, *J. Phys. Chem.*, **77**, 3092 (1973).
- 65. FIR Spectra of Liquid, Glass, and Crystalline States of ZnCl<sub>2</sub>: Order and Temperature Effects on Band Shape, C. A. Angell, G. H. Wegdam, and J. van der Elsken, Spectrochim. Acta, 30A, 665 (1974).
- Electrical Conductivity and Viscosity of Supercritical Isobutyric Acid-Water Solutions, P. M. Gammel and C. A. Angell, *J. Chem. Phys.*, 60, 584 (1974).
- 67. Glass Forming Molten Salt Systems, C. A. Angell and J. C. Tucker, in *Chemistry of Process Metallurgy*, Richardson Conference (Imperial College of Science, London, 1973), Eds. J. H. E. Jeffes and R. J. Tait, Insitute of Mining and Metallurgy Publication, 1974, p 207.
- 68. Glass Transition Temperature, Electrical Conductance, Viscosity, Molar Volume, Refractive Index, and Proton Magnetic Resonance Study of Chlorozinc Complexation in the System ZnCl<sub>2</sub> + LiCl + H<sub>2</sub>O, A. J. Easteal, E. J. Sare, C. T. Moynihan, and C. A. Angell, *J. Solution Chem.*, 3, 807 (1974).

- 69. Heat Capacities and Fusion Entropies of the Tetrahydrates of Calcium Nitrate, Cadmium Nitrate, and Magnesium Acetate. Concordance of Calorimetric and Relaxational 'Ideal' Glass Transition Temperatures, C. A. Angell and J. C. Tucker, *J. Phys. Chem.*, 78, 278 (1974).
- 70. Supercooling of Water to −92 °C Under Pressure, H. Kanno, R. J. Speedy, and C. A. Angell, *Science*, **189**, 880 (1975).
- On the Use of Structural Probe Ions for Relaxation Studies in Glasses. I. Spectroscopic Properties of Cobalt(II) in Chloride-Doped Potassium Nitrate-Calcium Nitrate Glasses, A. Barkatt and C. A. Angell, *J. Phys. Chem.*, 79, 2192 (1975).
- 72. Evidence for a Protonic Mechanism for the Anomalous Conductivity in Aqueous Acid Glasses, I. M. Hodge and C. A. Angell, *J. Non-Cryst. Solids*, **20**, 299 (1976).
- 73. Isothermal Compressibility of Supercooled Water and Evidence for a Thermodynamic Singularity at -45 °C, R. J. Speedy and C. A. Angell, *J. Chem. Phys.*, **65**, 851-858 (1976).
- Molecular Dynamics Studies of the Vitreous State: Simple Ionic Systems and Silica, L. V. Woodcock, C. A. Angell, and P. A. Cheeseman, J. Chem. Phys., 65, 1565 (1976).
- 75. Density Maxima in High-Pressure Supercooled Water, and a Relationship Between Water and Liquid SiO<sub>2</sub>, C. A. Angell and H. Kanno, *Science*, **193**, 1121 (1976).
- 76. Thermodynamics of the Glass Transition: Empirical Aspects, C. A. Angell and W. Sichina, *Ann. N.Y. Acad. Sci.*, **279** (Proc. Workshop on the Glass Transition and the Nature of the Glassy State), 53 (1976).
- Physico-Chemical and Computer Simulation Studies of the Role of Cation Coordination Numbers on Melt Physical Properties, C. A. Angell, I. M. Hodge, and P. A. Cheeseman, in *Molten Salts*, Proc. Int. Conf. Molten Salts, Ed. J. P. Pemsler, The Electrochemical Society Inc., 1976, p 138.
- 78. Kinetics of Structural Relaxation in the Glass Transformation Range of a Calcium-Potassium Nitrate Melt by Probe Ion Spectroscopy, C. A. Angell, A. Barkett, C. T. Moynihan, and H. Sasabe, in *Molten Salts*, Proceedings of the International Conference on Molten Salts, Ed. J. P. Pemsler, The Electrochemical Society Inc., 1976, p 195.
- 79. *Glass: Structure Spectroscopy*, J. Wong and C. A. Angell, Marcel Dekker: New York, 1976.
- 80. Spin-Echo Diffusion Coefficients of Water to 2380 bar and -20 °C, C. A. Angell, E. D. Finch, L. A. Woolf, and P. Bach, *J. Chem. Phys.*, **65**, 3063 (1976).
- 81. Pressure Dependence of the Glass Transition Temperature in Ionic Liquids and Solutions: Evidence Against Free Volume Theories, E. Williams and C. A. Angell, *J. Phys. Chem.*, **81**, 232 (1977).
- Heat Capacity and Glass Transition Thermodynamics for ZnCl<sub>2</sub>. A Failure of the First Davies-Jones Relation for dT/dP, C. A. Angell, E. Williams, K. J. Rao, and J. C. Tucker, *J. Phys. Chem.*, 81, 238 (1977).
- The Charge Transfer to Solvent Spectrum of Iodide in Supercooled Water and Glassforming Aqueous Solutions, A. Barkatt and C. A. Angell, *J. Phys. Chem.*, 81, 114 (1977).
- 84. Molecular Dynamics Modeling of Amorphous Solid Structures, C. A. Angell, P. A. Cheeseman, L. V. Woodcock, and J. H. R. Clarke, in *The Structure of Non-Crystalline Materials*, Ed. P. Gaskell, Taylor Publishing Co.: Cambridge, 1977, pp 191–194.

- Electrical Relaxation in Amorphous Protonic Conductors,
   I. M. Hodge and C. A. Angell, J. Chem. Phys., 67, 4 (1977).
- Mechanical Collapse vs. Ideal Glass Formation in Slowly Vitrified Solutions: A Plausibility Test, C. A. Angell and J. Donnella, *J. Chem. Phys.*, 67, 4560 (1977).
- 87. NMR Study of Proton-Transfer Interactions in the System Pyridine + HCl (0-95%), J. W. Shuppert and C. A. Angell, *J. Chem. Phys.*, **67**, 3050 (1977).
- 88. Electron Free Energy Levels and Spectroscopic Character of Dilute Species in Oxidic Solvents: Relating Aqueous to Liquid (and Vitreous) Oxide Solutions, C. A. Angell, in Spectroscopic and Electrochemical Characterization of Solute Species in Non-Aqueous Solvents, Ed. G. Mamantov, Plenum Press: New York, 1977, p 273.
- Homogeneous Nucleation and Glass Formation in Aqueous Alkali Halide Solutions at High Pressures, H. Kanno and C. A. Angell, *J. Phys. Chem.*, 81, 2639 (1977).
- 90. The Relative Permittivity of Supercooled Water, I. M. Hodge and C. A. Angell, *J. Chem. Phys.*, **68**, 1363 (1978).
- 91. Ionic Hydration and Secondary Relaxations in Vitrified Concentrated Aqueous Solutions, I. M. Hodge and C. A. Angell, *J. Phys. Chem.*, **82**, 1761 (1978).
- 92. Ionic Salt and Solution Glasses, C. A. Angell, invited contribution to *A Treatise on Glass*, Vol. I, Eds. D. R. Uhlmann and N. J. Kreidl, Academic Press: New York, 1983, pp 209–226.
- Glass Transition Temperatures for Simple Molecular Liquids and Their Binary Solutions, J. M. Sare, E. J. Sare, and C. A. Angell, *J. Phys. Chem.*, 82, 2622 (1978).
- 94. Use of Structural Probe Ions for Relaxation Studies in Glasses. II. T-Jump and T-Ramp Studies of Co(II) in Nitrate Glasses, A. Barkatt and C. A. Angell, *J. Phys. Chem.*, **82**, 1972 (1978).
- Highly Conducting Li-Rich Inorganic Glasses, S. I. Smedley and C. A. Angell, *Solid State Commun.*, 27, 1 (1978).
- Radiation Products and Tunneling Process in Ionic Glasses.
   Part I: Radiation Products and Recombination in Undoped Nitrate and Acetate Glasses, A. Barkatt, C. A. Angell, and J. R. Miller, *J. Phys. Chem.*, 82, 2143 (1978).
- Optical Probe Studies of Relaxation Processes in Viscous Liquids, A. Barkatt and C. A. Angell, *J. Chem. Phys.*, 70, 901 (1979).
- Water: Anomalous Compressibility to 1.9 kbar and Correlation with Supercooling Limits, H. Kanno and C. A. Angell, J. Chem. Phys., 70, 4008 (1979).
- Non-Vibrational Non-Diffusional Modes of Motion in Hydrated Calcium Nitrate Melts, I. M. Hodge and C. A. Angell, Proceedings of the Oxford Conference on Concentrated Solutions and Molten Salts, Plenum Press, New York, 1979, (invited).
- 100. Ionic Conductivity in Lithium Oxide-Fluoride Glasses, L. Boehm and C. A. Angell, Proceedings of Fast Ion Transport in Solids Conference, Lake Geneva, WI, Eds. P. Vashishta, J. N. Mundy, and G. K. Shenoy, Elsevier/ North Holland: New York, 1979, p 719.
- Pressure Dependence of the Glass Transition Temperature in Molecular Liquids and Plastic Crystals, T. Atake and C. A. Angell, *J. Phys. Chem.*, 83, 3218 (1979).
- Heat Capacity Changes in Glass-Forming Aqueous Solutions, and the Glass Transition in Vitreous Water, C. A. Angell and J. C. Tucker, *J. Phys. Chem.*, 84, 268 (1980).

- 103. D. C. Conductivity and Secondary Structural Relaxation in High Conducting Li<sup>+</sup> Glasses, L. Boehm and C. A. Angell, J. Non-Cryst. Solids, 40, 83 (1980).
- 104. Supercooled and Superheated Water, C. A. Angell, in Water and Steam, Proceedings of the Ninth International Conference on the Properties of Steam, Munich (1979), Eds. F. Straub and K. Scheffler, Pergammon Press: Elmsford, NY, 1980, p 233 (invited article).
- 105. Proton NMR Studies of the Lewis Acid-Base Reactions Between Pyridinium Chlorides and the Acids ZnCl<sub>2</sub> and AlCl<sub>3</sub>, C. A. Angell and J. W. Shuppert, J. Phys. Chem., **84**, 538 (1980).
- 106. Vibrational Bandshapes in Viscous Liquids and Glasses, C. A. Angell, text of an invited contribution to the NATO Advanced Summer Institute published as Vibrational Spectroscopy in Molecular Liquids and Solids, Eds. E. M. Pick and S. Bratos, Plenum Press: New York, 1980, p 187.
- 107. Fast Li<sup>+</sup> Conduction in Fluoroborate Glasses, S. I. Smedley and C. A. Angell, Mater. Res. Bull., 15 (4), 421 (1980).
- 108. Application of the Rheovibron to Inorganic Glass Problem I. The Mixed Alkali Effect Loss Spectrum, T. Atake and C. A. Angell, Proceedings of the International Congress on Glass XII, Albuquerque, NM, J. Non-Cryst. Solids, 38 & 39, 439-444 (1980).
- 109. Glass Formation in Aqueous Sodium Salt Solutions, C. A. Angell and E. J. Sare, Cryo-Lett., 1, 257 (1980).
- 110. Volumetric and Derived Thermal Characteristics of Liquid D<sub>2</sub>O at Low Temperatures and High Pressures, H. Kanno and C. A. Angell, J. Chem. Phys., 73, 1940 (1980).
- 111. Volumetric and Derived Thermal Characteristics of Liquid  $H_2O + H_2O_2$ , and  $HO + N_2H_4$ , Binary Solutions; Isolation of a Singular Component for  $C_p$  of Supercooled Water, M. Oguni and C. A. Angell, J. Chem. Phys., 73, 1948 (1980).
- 112. Supercooled Water, C. A. Angell, in Water: A Comprehensive Treatise, Vol. 7, Ed. F. Franks, Plenum Press: New York, 1982, pp 215-338 (invited article).
- 113. Interaction Potentials and Glass Formation: A Survey of Computer Experiments, C. A. Angell, J. H. R. Clarke, and L. V. Woodcock, Adv. Chem. Phys., 48, 397-453 (1981). (Result of NATO collaboration) (invited article).
- 114. d.c. Conductivities, Electrical Relaxation Spectra, and Conduction Mechanisms in Lithium Oxide-Fluoride Glasses of the System LiF-Li<sub>2</sub>O-B<sub>2</sub>O<sub>3</sub> and LiF-Li<sub>2</sub>O-Al(PO<sub>3</sub>)<sub>3</sub>, S. I. Smedley and C. A. Angell, J. Am. Ceram. Soc., submitted.
- 115. Visible Spectroscopy of Irradiated High Alkali Borate and Mixed Alkali Phosphate Glasses, A. Barkatt, C. A. Angell, and J. R. Miller, J. Am. Ceram. Soc., 64, 158 (1981).
- 116. Test of a Year-Annealed Glass for the Cohen-Grest Percolation Transition, L. Boehm, M. D. Ingram, and C. A. Angell, J. Non-Cryst. Solids, 44, 305 (1981).
- 117. Temperature Dependence of the Dynamic Structure Factor for Supercooled  $Sn_{(1-x)}Pb_x$  Alloys. A Test of Instability Theories for the L S Phase Transition, J.-B. Suck, J. H. Perepezko, I. E. Anderson, and C. A. Angell, Phys. Rev. Lett., 47, 424 (1981).
- 118. The Glass Transition: Comparison of Computer Simulation and Laboratory Studies, C. A. Angell, Trans. N. Y. Acad. Sci., 371, 136 (1981).

- 119. Inorganic Chloride and Mixed Halide Glasses with Low Maximum Phonon Frequencies, C. A. Angell and D. C. Ziegler, *Mater. Res. Bull.*, **3** (16), 279 (1981).
- 120. Homogeneous Nucleation and Glass Transition Temperatures in Solutions of Li Salts in D<sub>2</sub>O and H<sub>2</sub>O, C. A. Angell, E. J. Sare, J. Donnella, and D. R. MacFarlane, J. Phys. Chem., 85, 1461 (1981).
- 121. Non-Oxide Glasses, Article No. M145-00264, C. A. Angell, in Encyclopedia of Materials Science and Engineering, Ed. M. B. Bever, Pergamon Press, Elmsford, NY, 1986.
- 122. Amorphous Solids: Types, Characteristics and Challenges, C. A. Angell, in Preparation and Characterization of Materials, Eds. C. N. R. Rao and J. M. Honig, Academic Press: New York, 1981, p 449 (invited paper).
- 123. Far IR Spectra and Electrical Conductivity of Li and Na Glasses by Laboratory and Computer Simulation Experiments, C. A. Angell, L. Boehm, P. A. Cheeseman, and S. Tamaddon, Solid State Ionics, 5, 659 (1981).
- 124. Fast Ion Conduction in Cubic Perovskite Structures: An Ion Dynamics Study of NaMgF3, P. A. Cheeseman and C. A. Angell, Solid State Ionics, 5, 597 (1981).
- 125. Heat Capacity of Water at Extremes of Supercooling and Superheating, C. A. Angell, W. J. Sichina, and M. Oguni, J. Phys. Chem., 86, 998 (1982).
- 126. Conductometric and Calorimetric Methods for the Study of Homogeneous Nucleation and Crystallization Below Both T<sub>h</sub> and T<sub>c</sub>, C. A. Angell and D. R. MacFarlane, Adv. Ceram., 4, 66 (1981).
- 127. Diffusivity of the Hard-Sphere Model in the Region of Fluid Metastability, L. V. Woodcock and C. A. Angell, Phys. Rev. Lett., 47, 1129 (1981).
- 128. Homogeneous Nucleation and Glass Formation in Cryoprotective Systems at High Pressure, D. R. MacFarlane, C. A. Angell, and G. M. Fahy, Cryo-Lett., 2, 353-358
- 129. Viscosity-Temperature Function for Sorbitol from Combined Viscosity and Differential Scanning Calorimetry Studies, C. A. Angell, R. Stell, and W. J. Sichina, J. Phys. Chem., 86, 1540 (1982).
- 130. Controlled Nucleation and Quasi-Ordered Growth of Ice Crystals from Low-Temperature Electrolyte Solutions; A Small Angle Neutron Scattering Study, J. Dupuy, P. Chieux, R. Calemczuk, J. F. Jal, C. Ferradou, A. Wright, and C. A. Angell, *Nature*, **296**, 138-140 (1982).
- 131. Optical vs Thermodynamic Basicities: Probe Pb<sup>2+</sup> Ion Spectra in Molten Chloroaluminate Solutions, C. A. Angell and P. D. Bennett, *Inorg. Chem.*, **104**, 3604 (1982).
- 132. Water A Fascinating Molecular Substance (Les anomalies de l'eau), C. A. Angell, LaRecherche, 5, 584-593 (1982) (invited article).
- 133. Test of the Entropy Basis of the VTF Equation: Dielectric Relaxation of Polyalcohols Near  $T_g$ , C. A. Angell and D. L. Smith, J. Phys. Chem., 86, 3845 (1982).
- 134. An Inexpensive High-Pressure Optical Absorption Cell for IR-VIS-UV Studies, V. E. Rodgers and C. A. Angell, J. Chem. Educ., 60, 602 (1983).
- 135. Water-like Transport Property Anomalies in Liquid Silicates Investigated at High T and P by Computer Simulation Techniques, C. A. Angell, P. A. Cheeseman, and S. Tamaddon, *Bull. Mineral.*, **1–2**, 87–99 (1983).
- 136. An Emulsion Technique for the Study of Marginal Glass Formation in Molecular Liquids, D. R. MacFarlane and C. A. Angell, J. Phys. Chem., 86, 1927 (1982).

- High Refractive, Low ABBE Number, Halide Glasses, D.
   C. Ziegler and C. A. Angell, Appl. Opt., 21, 2096 (1982).
- 138. Tailoring Stimulated Emission Cross Sections of Nd<sup>3+</sup> Laser Glass: Observation of Large Cross Sections for BiCl<sub>3</sub> Glasses, M. Weber, D. C. Ziegler, and C. A. Angell, *J. Appl. Phys.*, **53** (6), 4344–4350 (1982).
- Pressure Enhancement of Ion Mobilities in Liquid Silicates from Computer Simulation Studies to 800 kbar, C. A. Angell, P. A. Cheeseman, and S. Tamaddon, *Science*, 218, 885 (1982).
- 140. Anomalous Components of Supercooled Water Expansivity. Compressibility and Heat Capacity ( $C_p$  vs  $C_v$ ) from Binary Formamide + Water Solution Studies, M. Oguni and C. A. Angell, *J. Chem. Phys.*, **78** (12), 7334 (1983).
- 141. Short Time Structural Relaxation Processes: Comparison of Experimental and Computer Simulation Glass Transitions on Equivalent Time Scales, L. M. Torell and C. A. Angell, J. Chem. Phys., 78, 937 (1983).
- 142. Near Infra-Red Spectra and the Disrupted Network Model of Normal and Supercooled Water, C. A. Angell and V. Rodgers, *J. Chem. Phys.*, **80**, 6245 (1984).
- 143. Cooling Rate Dependence of the Ice I Nucleation Temperature in Aqueous LiCl Solutions, D. R. MacFarlane, R. K. Kadiyala, and C. A. Angell, *J. Phys. Chem.*, **87**, 235 (1983).
- 144. Computer Simulation Studies of Migration Mechanisms in Ionic Glasses and Liquids, C. A. Angell, P. A. Cheeseman, and S. Tamaddon, *J. Phys. Colloq.*, **43**, C9–381 (1982).
- 145. Tetrahedrally Coordinated Ionic Liquids, Anomalous Transport Properties, and Geophysical Significance, C. A. Angell, P. A. Cheeseman, and S. Tamaddon in Lecture Notes in Physics, Eds. K.-H. Bennemann, F. Brouers, and D. Quitmann, Springer-Verlag: New York, 1982, p 131.
- 146. Hydrophobic and Hydrophilic Solute Effects on the Homogeneous Nucleation Temperature of Ice from Aqueous Solutions, M. Oguni and C. A. Angell, *J. Phys. Chem.*, **87**, 1848 (1983).
- 147. Direct Observation of Time-Temperature-Transformation Curves for Crystallization of Ice from Solutions by a Homogeneous Mechanism, D. R. MacFarlane, R. K. Kadiyala, and C. A. Angell, *J. Phys. Chem.*, 87, 1094 (1983).
- 148. On the Problem of Homogeneous Nucleation in Fluoride Glasses, M. Matecki, M. Poulain, J. Lucas, D. R. MacFarlane, and C. A. Angell, *Mater. Res. Bull.*, 18, 293 (1983).
- 149. Supercooled Water, C. A. Angell, *Annu. Rev. Phys. Chem.*, **34**, 593–630 (1983) (invited article).
- 150. Homogeneous Nucleation and Growth of Ice from Solutions: TTT Curves, the Nucleation Rate and the Stable Glass Criterion, D. R. MacFarlane, K. Kadiyala, and C. A. Angell, *J. Chem. Phys.*, **79** (8), 3921 (1983).
- 151. Contrasting Effect of Tetrahedral and Octahedral Complexing of Trivalent Cations on Binary Molten Salt Solution Transport Properties, C. A. Angell and A. Elias, *J. Phys. Chem.*, **87**, 4704–4709 (1983).
- 152. Far-IR Transmitting Cadmium Iodide Based Glasses, E. I. Cooper and C. A. Angell, *J. Non-Cryst. Solids*, **56**, 75 (1983).
- 153. Fast Ion Motion in Glassy and Amorphous Materials, C. A. Angell, *Solid State Ionics*, **9 & 10**, 3 (1983).

- 154. Versatile Organic Iodide Melts and Glasses with High Mole Fractions of LiI: Glass Transition Temperatures and Electrical Conductivities, E. I. Cooper and C. A. Angell, *Solid State Ionics*, **9 & 10**, 617 (1983).
- 155. CO<sub>2</sub>-Retention in High Alkali Borate Glasses, S. W. Martin, E. I. Cooper, and C. A. Angell, *Commun. J. Am. Ceram. Soc.*, 66 (9), C-153 (1983).
- 156. Separation of Nucleation from Crystallization Kinetics by Two Step Calorimetry Experiments, R. K. Kadiyala and C. A. Angell, *Colloids Surf.*, 11, 341 (1984) (invited conference paper).
- Non-existent Glass Transition for Amorphous Solid Water,
   D. R. MacFarlane and C. A. Angell, *J. Phys. Chem.*,
   88, 759 (1984).
- 158. Electronic Spectra and Coordination of Ni<sup>2+</sup> in Potassium Borate Glass and Melt to 1,000 °C, T. C. Lin and C. A. Angell, *Commun. Am. Ceram. Soc.*, **67**, C33 (1984).
- 159. Glass Formation and Transition Temperatures in Sodium and Lithium Aluminoborate Melts up to 72 mol % Alkali, S. W. Martin and C. A. Angell, *J. Non-Cryst. Solids*, **66**, 429 (1984).
- 160. Fast Cu<sup>+</sup> Ion Conducting Phosphate Iodide-Glasses, C. Liu and C. A. Angell, *Solid State Ionics*, **13**, 105 (1984).
- Conductivity Maximum in Aluminoborate Glasses, S. W. Martin and C. A. Angell, *Commun. J. Am. Ceram. Soc.*, 67, C148 (1984).
- 162. Emulsion Techniques for the Study of Glass Formation II. Low Melting Point Salt Hydrates, D. R. MacFarlane, C. A. Angell, J. Phys. Chem., 88, 4779 (1984).
- 163. Short Time Relaxation Processes in Liquids from Viscosity and Light Scattering Studies in Molten KCl·2BiCl<sub>3</sub>, L. M. Torell, D. C. Ziegler, and C. A. Angell, *J. Chem. Phys.*, 81, 5053 (1984).
- 164. Fluoride Bridging Modes in Fluorozirconate Glasses by X-ray and Computer Simulation Studies, J. Lucas, C. A. Angell, and S. Tamaddon, *Mater. Res. Bull.*, 19, 945 (1984).
- 165. Strong and Fragile Liquids, C. A. Angell, in *Relaxations in Complex Systems*, Eds. K. Ngai and G. B. Wright, National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161, 1985, p 1.
- 166. Fast Ion Conductors in Viscous Liquids and Glasses, C. A. Angell, in *Relaxations in Complex Systems*, Eds. K. Ngai and G. B. Wright, National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161, 1985.
- 167. Vitrification as an Approach to Cryopreservation, G. M. Fahy, D. R. MacFarlane, C. A. Angell, and H. T. Meryman, *Cryobiology*, **21**, 407–426 (1984).
- 168. Glass Forming Microemulsions, C. A. Angell, R. K. Kadiyala, and D. R. MacFarlane, *J. Phys. Chem.*, **88**, 4593 (1984).
- 169. Glass Forming Microemulsions: Vitrification of Simple Liquids, and Electron Microscope Probing of Droplet Packing Modes, J. Dubochet, M. Adrian, J. Teixeira, R. K. Kadiyala, C. M. Alba, D. R. MacFarlane, and C. A. Angell, *J. Phys. Chem.*, 88 (Debye Memorial Issue), 6727 (1984) (invited contribution).
- 170. Al<sup>3+</sup> Coordination Changes in Liquid Silicates under Pressure, E. Ohtani, F. Taulelle, and C. A. Angell, *Nature*, **314**, 78 (1985).

- 171. Glasses and Glassy Crystals from Molecular Ionic Systems, C. A. Angell, L. E. Busse, E. E. Cooper, R. K. Kadiyala, A. Dworkin, M. Ghelfenstein, H. Szwarc, and A. Vassal, *J. Chim. Phys.*, 82, 267 (1985).
- 172. Silver Alkali Halide Glasses and a Vitreous Analogue of the RbAg<sub>4</sub>I<sub>5</sub> Superionic Conductor, Changle Liu, H. G. K. Sundar, and C. A. Angell, *Mater. Res. Bull.*, 20, 525 (1985).
- 173. Spectroscopy, Simulation, and the Medium Range Order Problem in Glass, C. A. Angell, *J. Non-Cryst. Solids*, Kreidl Symposium (text of invited talk), **73**, 1 (1985).
- 174. d.c. and a.c. Conductivity in Wide Composition Range Li<sub>2</sub>O-P<sub>2</sub>O<sub>5</sub> Glasses, S. W. Martin and C. A. Angell, *J. Non-Cryst. Solids*, **83**, 185 (1986).
- 175. Optical and Thermodynamic Basicities: UV Spectra of Tl<sup>+</sup>, Pg<sup>2+</sup> and Bi<sup>3+</sup> in Molten Chloroaluminates Titrations, P. D. Bennett and C. A. Angell, *Inorg. Chem.*, **24**, 3030 (1985).
- 176. Strong and Fragile Plastic Crystals, C. A. Angell, A. Dworkin, P. Figuiere, A. Fuchs, and H. Szwarc, *J. Chim. Phys.*, 82, 773 (1985).
- 177. Mechanical versus Electrical Relaxation in AgI-based Fast Ion Conducting Glass, Changle Liu and C. A. Angell, *J. Non-Cryst. Solids*, **83**, 162 (1986).
- 178. Spectroscopic Studies of Chemically Liberated "Free-OH" Groups in Aqueous N<sub>2</sub>H<sub>4</sub>-NH<sub>3</sub> and CH<sub>3</sub>NH<sub>2</sub> Solutions, C. A. Angell and Dana L. Fields, *J. Phys. Chem.*, **89**, 4565 (1985).
- 179. Crystallization and Vitrification in Aqueous Systems, C. A. Angell and Y. Choi, *J. Microsc.*, **141**, 251 (1986) (text of Plenary Lecture).
- 180. Far IR Transmitting Halide Glasses, C. A. Angell, Changle Liu, and H. G. K. Sundar, *Mater. Sci. Forum*, **5**, 189 (1985) (extended abstract).
- 181. A Model for Fluorozirconate Glass Structure, J. Lucas and C. A. Angell, *Mater. Sci. Forum*, **6**, 449, (1985) (extended abstract).
- 182. Mechanical Relaxation by Mobile Ions Cu<sup>+</sup> and Ag<sup>+</sup> in Fast Ion Conducting Glasses, Changle Liu and C. A. Angell, *J. Phys. Colloq.*, C10, Suppl. No. 12, 46, 493–496 (1985).
- 183. Picosecond Mechanical Relaxation due to Fast Ion Diffusion and Structural Relaxation in AgI-Rich Glassforming Systems, L. Borgesson, S. W. Martin, L. M. Torell, and C. A. Angell, in *Transport-Structure Relations in Fast Ion and Mixed Conductors*, Eds. F. W. Poulsen et al., Riso National Lab., Denmark, 1985, p 383.
- 184. Ambient Temperature Plastic Crystal Fast Ion Conductors (PLICFICS), E. I. Cooper and C. A. Angell, *Solid State Ionics*, 18 & 19, 570 (1986).
- 185. Glass Formation and High Conductivity in Lead Halide-Lead Metaphosphate Glasses, H. G. K. Sundar, S. W. Martin, and C. A. Angell, *Solid State Ionics*, **18 & 19**, 437 (1986).
- 186. All Halide Superionic Glasses, Changle Liu, H. G. K. Sundar, and C. A. Angell, *Solid State Ionics*, **18 & 19**, 442 (1986).
- 187. Recent Developments in Fast Ion Transport in Glassy and Amorphous Materials, C. A. Angell, *Solid State Ionics*, **18 & 19**, 72 (1986) (text of plenary lecture).
- 188. Sequential Hypersonic Dampings Due to Fast Ion Diffusion and Structural Relaxation in (AgI)<sub>x</sub>(AgPO<sub>3</sub>)<sub>1-x</sub> Ionic Liquids, L. Borjesson, S. W. Martin, L. M. Torell, and C. A. Angell, *Solid State Ionics*, **18 & 19**, 141 (1986).

- Brillouin Scattering in AgI-Rich Glasses, L. Borgesson, S. W. Martin, L. Torell, and C. A. Angell, *Solid State Ionics*, 18 & 19, 431 (1986).
- 190. Long Time Relaxation Processes in Glassy Solids I. α-Relaxations in 'Fragile' Systems, H. G. K. Sundar and C. A. Angell, XIVth International Congress on Glass, Collected Papers, Indian Ceramic Society Pub. II, 161 (1986).
- 191. Long Time Relaxation Processes in Glassy Solids II.  $\beta$  Relaxations in Fast Ion Conducting Glasses. A. Kulkarni, H. Senapati, Changle Liu, and C. A. Angell, XIVth International Congress on Glass, Collected Papers, Indian Ceramic Society Pub. II, 169 (1986).
- 192. Glass-Forming Microemulsions and Their Structure, D. R. MacFarlane, I. R. McKinnon, E. A. Hildebrand, and C. A. Angell, in *Microemulsion Systems*, Ed. H. Rosano, Marcel Dekker: New York, 1987, p 311.
- 193. Dynamics of Compressed and Stretched Liquid SiO<sub>2</sub>, and the Glass Transition, C. A. Angell, P. A. Cheeseman, and C. C. Phifer, *Mater. Res. Soc. Symp. Proc.*, **63**, 85–94 (1986).
- 194. Glassy Solids and dc Conductivity in the Liquid and Glassy States, C. A. Angell, in *Materials for Solid State Batteries*, Eds. B. V. R. Chowdari and S. Radhakrishna, World Scientific Pub. Co.: Singapore, 1986, pp 31–40.
- 195. High Conductivity and Mechanical Loss in PbF<sub>2</sub>-MnF<sub>2</sub>-Al(PO<sub>3</sub>)<sub>3</sub> Glasses, A. R. Kulkarni and C. A. Angell, *Mater. Res. Bull.*, 21, 1115 (1986).
- 196. On the Glass Transition and Viscosity of P<sub>2</sub>O<sub>5</sub>, S. W. Martin and C. A. Angell, *J. Phys. Chem.*, **90** (25), 6736 (1986).
- 197. Diffusivity and Thermodynamic Properties of Diopside and Jadeite Melts by Computer Simulation Studies, C. A. Angell, P. A. Cheeseman, and R. R. Kadiyala, *Chem. Geol.*, 62, 85–95 (1987).
- 198. Relaxation Processes in Glassy Solids, C. A. Angell, H. G. K. Sundar, A. R. Kulkarni, H. Senapati, and S. W. Martin, in *Molecular Dynamics and Relaxation Phenomena in Glasses*, Eds. Th. Dorfmuller and G. Williams, Lecture Notes in Physics, Springer-Verlag: New York, 277: 75–89 (1987).
- 199. The Kauzmann Paradox, Metastable Liquids, and Ideal Glasses: A Summary, C. A. Angell, D. R. MacFarlane, and M. Oguni., *Ann. N.Y. Acad. Sci.*, **484**, 241 (1986).
- Dynamics of Structural Change in Liquids and Glasses, Ann. N.Y. Acad. Sci., Vol. 484, Eds. C. A. Angell and M. Goldstein, New York Academy of Science, New York, 1986.
- A Structural Model for Prototypical Fluorozirconate Glass, Jacques Lucas, C. Laval, Carol C. Phifer, and C. Austen Angell, J. Non-Cryst. Solids, 94, 315 (1987).
- 202. Transport and Relaxation Processes in Molten Salts, in *Molten Salt Chemistry*, Eds. G. Mamantov and R. Marassi, NATO ASI Series, Plenum Press: New York, 202, 123 (1987).
- 203. Far Infrared and Dielectric Relaxation Spectra in Supercooled Water and Water + Propylene Glycol Solutions, L. Boehm, D. L. Smith, and C. A. Angell, *J. Mol. Liquids* (invited for R. H. Cole Honor Issue), 36, 153 (1987).
- 204. High Fluoride Ion Conduction and Conductivity Maxima with the Glassy System PbF<sub>2</sub>-MnF<sub>2</sub>-Pb(PO<sub>3</sub>)<sub>2</sub>, A. R. Kulkarni, H. G. K. Sundar, and C. A. Angell, *Solid State Ionics*, **24**, 253 (1987).

- 205. Crystallization Kinetics in InF<sub>3</sub>-Based Glasses by Single and Multistep Calorimetry Techniques, H. Senapati and C. A. Angell, *Mater. Sci. Forum*, **19–20**, 443 (1987).
- 206. High Ionic Conductivity in PEO•PPG Block Polymer + Salt Solutions, Ronjian Xue and C. A. Angell, *Solid State Ionics*, **25**, 223 (1987).
- Ionic Conductivity in Wide-Range Halide-Pyrophosphate Glasses, H. G. K. Sundar, Changle Liu, and C. A. Angell, *Mater. Res. Bull.*, 22, 1533 (1987).
- Mechanical and Electrical Relaxation Due to Mobile Ions in a Superionic Glass Over the Range 1 Hz-20 GHz, L. Borjesson, L. M. Torell, S. W. Martin, Changle Liu, and C. A. Angell, *Phys. Lett.*, 125, 330 (1987).
- Complexation and Transport Properties in Binary Glass-Forming Molten Chloride Systems, A. Elias and C. A. Angell, J. Chem. Eng. Data, 32, 1 (1988).
- Mobile Ion Crossover Effects in the System LiF-PbF<sub>2</sub>-Al(PO<sub>3</sub>)<sub>3</sub>. From "Electrical, Mechanical, and T<sub>g</sub> Studies",
   A. R. Kulkarni and C. A. Angell, J. Non-Cryst. Solids,
   99, 195 (1988).
- Supercooled Water: Approaching the Limits, C. A. Angell, News and Views Section of *Nature*, 331, 206 (1987).
- 212. Ion Dynamics Studies of Liquid and Glassy Silicates, and Gas-in-Liquid-Silicate Solutions, C. A. Angell, Carol Scamehorn, Carol C. Phifer, R. R. Kadiyala, and P. A. Cheeseman, *Phys. Chem. Miner.*, **15**, 221 (1988).
- 213. Crystallization and Vitrification in Cryoprotected Aqueous Systems, C. A. Angell and H. Senapati, in *The Biophysics of Cryopreservation*, Eds. D. E. Pegg and A. M. Karow, Plenum Press: New York, 1987, p 147.
- 214. Ion-Matrix Coupling in Polymer Electrolytes from Relaxation Time Studies, L. M. Torell and C. A. Angell, *Polym. J.* (Proceedings of the First International Conference on Polymer Electrolytes), *Br. Polym. J.*, 20, 173 (1988).
- 215. New Modes of Glass Formation Using Negative Pressure Quenching and Superstructuring Principles, C. A. Angell, J. Green, D. List, Z. Qing, H. Senapati, and J. C. Tucker, (Proceedings of the Nashville Conference on Effect of Modes of Formation on Glass Structure and Properties, Eds. W. Kinser and R. A. Weeks, *Diffus. Defect Data*, 53–54, 77 (1987).
- 216. Liquid Water in Metastable States, a contribution to the first "Advances" Supplement to the *Encyclopedia of Materials Science and Engineering*, Ed. R. W. Cahn, Pergammon: Elmsford, NY, 1988, p 577.
- Contrasting Conductance/Viscosity Relations in Glassy and Polymer 'Solid' Electrolytes, M. McLin and C. A. Angell, *J. Phys. Chem.* (Letters Section), 92, 2083 (1988).
- Structural Instability and Relaxation in Glassy Phases, C.
   A. Angell, J. Non-Cryst. Solids, 102, 205 (1988).
- 219. Perspectives on the Glass Transition, C. A. Angell, invited contribution to the Perspectives section of *J. Phys. Chem. Solids*, **49** (8), 863 (1988).
- 220. Generation of Fractal Silicas by Negative Pressure Stretching of SiO<sub>2</sub> Glass, J. Kieffer and C. A. Angell, (Proceedings of the Conference on Industrial Applications of Computer Simulation, Ed. N. Quirke, U. F.), *Mol. Simul.*, 3, 137 (1989).
- 221. Influence of Cation Coordination Numbers on Transport Properties of Ionic Liquid Mixtures, A. Elias and C. A. Angell, J. Phys. Chem. (Letters Section), 92, 5858 (1988).
- 222. Structural Motifs in Fluoride Glasses and Their Influence on Liquid and Glassy State Properties, C. A. Angell and C. C. Phifer, *Mater. Sci. Forum*, **32–33**, 373 (1988).

- 223. Structural Characterization of Glass-Forming O/W Microemulsions by Neutron Scattering, C. Alba-Simionesca, J. Teixeira, and C. A. Angell, *J. Chem. Phys.*, 91, 395 (1989).
- 224. (a) Correlation of Mechanical and Electrical Relaxation Phenomena in Superionic Glasses, C. A. Angell, *Mater. Chem. Phys.*, 23, 143 (1989). (b) High-Pressure Synthesis of Nitride Glasses, T. Grande, S. Jacob, J. R. Holloway, P. F. McMillan, and C. A. Angell, *J. Non-Cryst. Solids*, 184, 151 (1995).
- 225. Phenomenology of Fast Ion Conducting Glasses: Facts and Confusions, C. A. Angell, in *Solid Electrolytes*, Ed. T. Takahashi, World Scientific Press: Singapore, 1989, p 89.
- 226. The Glass Transition: An Assessment of Current Thinking, C. A. Angell, *Nuclear Physics B., Proc. Suppl.*, *5A*, 69 (1988). (Text of presentation to University of California Statistical Mechanics Conference, March 1988).
- 227. Generation of Fractal Structures by Negative Pressure Rupturing of SiO<sub>2</sub> Glass, J. Kieffer and C. A. Angell, *J. Non-Cryst. Solids*, **106**, 336 (1988).
- Structural Incompatibilities and Phase Separation in Molten Binary Silicates - - a Molecular Dynamics Study, J. Kieffer and C. A. Angell, *J. Chem. Phys.*, 90, 4982 (1989).
- 229. Glass Formation and Conductivity in the Ag<sub>2</sub>S-AgPO<sub>3</sub> System: Evidence Against Cluster Pathway Mechanisms for High Ionic Conductivity, L. Jun, J. Portier, B. Tanguy, J. J. Videau, and C. A. Angell, *Solid State Ionics*, 345, 87 (1989).
- Phase Relations and Vitrification in Saccharide-Water Solutions and the Trehalose Anomaly, J. L. Green and C. A. Angell, *J. Phys. Chem.*, 93, 2880 (1989).
- 231. Glassforming Liquid Oxides at the Fragile Limit of the Viscosity—Temperature Relationship, C. A. Angell, C. A. Scamehorn, D. L. List, and J. Kieffer (Contribution to Proceedings of the XVth International Congress on Glass - - Leningrad, 1989), Ed. O. V. Mazurin, Leningrad, NAVKA, 1989, p 204.
- 232. Glass in a Stretched State by Negative-Pressure Vitrification: Trapping In and Relaxing Out, C. A. Angell and Zheng Qing, *Phys. Rev. B*, Rapid Commun., **39**, 8784 (1989).
- 233. Effect of Pressure on Conductivity in Liquid and Glassy States of a Superionic Conducting Glass, C. A. Angell and J. Zhou, *Solid State Ionics*, 34, 243 (1989).
- 234. Transition Range Viscosity of Rapidly Quenched Bi-Ca-Sr-Cu-O Glasses, M. Tatsumisago, C. A. Angell, S. Tsuboi, Y. Akamatsu, N. Tohge, and T. Minami, *Appl. Phys. Lett.*, **54**, 2268 (1989).
- 235. Crystallization Kinetics for Quenched Bi-Ca-Sr-Cu-O Glasses. M. Tatsumisago, C. A. Angell, Y. Akamatsu, S. Tsuboi, N. Tohge, and T. Minami, *Appl. Phys. Lett.*, 55, 600 (1989).
- The Relation Between Debye and Non-Exponential Relaxation in Glassforming Alcohols, M. A. Floriano and C. A. Angell, *J. Chem. Phys.*, 91, 2537 (1989).
- 237. Non-Random Mixing and Fast Ion Decoupling Lithium in Lithium Chloroborate Superionic Glasses: An Ion Dynamics Computer Simulation Study, R. Syed, J. Kieffer, and C. A. Angell, Symp. Mater. Res. Soc., 135, 73 (1989).
- 238. AC and DC Studies of Non-Exponential Relaxation Processes in Superionic Conductors: Correlation of Conductivity and NMR Studies, C. A. Angell and S. W. Martin, Symp. Mater. Res. Soc., 135, 63 (1989).

- 239. Fast Ion Conduction in Glass; the New Solid Electrolytes, C. A. Angell, Proc. Workshop on Application of Glasses, Bangalore, India, Nov. 1988, Eds. K. J. Rao, A. R. Cooper, and H. Jain, World Scientific Pub.: Singapore, 1989, p 245.
- 240. Thermodynamic Aspects of the Vitrification of Toluene, and Xylene Isomers, and the Fragility of Liquid Hydrocarbons, C. Alba, L. E. Busse, and C. A. Angell, *J. Chem. Phys.*, **92**, 617–624 (1990).
- 241. Transformation Range Viscosity for Various Kinds of Glassy Liquids, M. Tatsumisago and C. A. Angell, *Proceedings of the 30th Glass Meeting*, Japan, Sept. 28, 1989.
- 242. Transition Range Viscosity of Quenched Bi-Ca-Sr-Cu-O Glasses with Several Additives, M. Tatsumisago, C. A. Angell, N. Tohge, and T. Minami, *Chem. Express*, 5, 9 (1990).
- 243. Structure and Properties of New Glasses in the System TII-AgNO<sub>3</sub>, L. Jun, B. Tanguy, J. J. Videau, J. Portier, and C. A. Angell, *Mater. Sci. Eng.*, **5**, 413 (1990).
- 244. The Surface Tension and Molar Surface Free Energy of Water to -27.2 °C, M. A. Floriano and C. A. Angell, *J. Phys. Chem.*, **94**, 4199 (1990).
- 245. Transport Processes, Relaxation, and Glass Formation in Hydrogen-Bonded Liquids, C. A. Angell, in *Hydrogen-Bonded Liquids*, Eds. J. C. Dore and J. Teixeira, NATO-ASI Series, Plenum Press: New York, 1990.
- 246. Mid and Far IR Absorption of Alkali Borate Glasses, and the Limit of Superionic Conductivity, Changle Liu and C. A. Angell, *J. Chem. Phys.*, **93**, 7378 (1990).
- 247. Dynamic Processes in Ionic Glasses. C. A. Angell, *Chem. Rev.*, **90**, 523 (1990).
- 248. Fragility of Ge-As-Se Glassforming Liquids in Relation to Rigidity Percolation and the Kauzmann Paradox, M. Tatsumisago, B. L Halfpap, J. L. Green, S. M. Lindsay, and C. A. Angell, *Phys. Rev. Lett.*, **64**, 1549 (1990).
- 249. Metastable Liquids: Phenomenology in Stretched and Supercooled States, C. A. Angell and J. L. Green, in Lectures on Thermodynamics and Statistical Mechanics (Proceedings of the XIXth Winter Statistical Mechanics Meeting, Oextepec, Mexico, Jan. 2–5, 1990), Eds. M. Lopez de Haro and C. Varea, World Scientific: Singapore, 1990, p 155.
- 250. Water and Solutions in the High Tension Regime: Raman Spectroscopic Study to ~80 MPa Negative Pressure, J. L. Green, D. J. Durben, G. H. Wolf, and C. A. Angell, *Science*, 249, 649 (1990).
- 251. Effects of Coordination Environment on the Zr-F Symmetric Stretching Frequency of Fluorozirconate Glasses, Crystals and Melts, Carol C. Phifer, David J. Gostola, John Kieffer, and C. Austen Angell, *J. Chem. Phys.*, **94**, 3440 (1991).
- 252. Liquids, Rotator Phases, and Glass Transitions in Relation to Cation Symmetry in C12 Tetra-alkylammonium Bromides, E. I. Cooper and C. A. Angell, *J. Phys. Chem.* (under revision).
- Liquids at Large Negative Pressures: Water at the Homogeneous Nucleation Limit, Q. Zheng, D. J. Durben, G. H. Wolf, and C. A. Angell, *Science*, 254, 829 (1991).
- 254. Thermodynamic Aspects of the Glass Transition in Liquids and Plastic Crystals, C. A. Angell, *Pure and Appl. Chem.* (Text of Plenary Lecture), 63, 1387 (1991).
- 255. Glass Formation and Anomalous Annealing Effects in the Mixed-Anion System Ag<sub>2</sub>SO<sub>4</sub>-Ag<sub>2</sub>WO<sub>4</sub>-AgI, H. Senapati and C. A. Angell, *J. Non-Cryst. Solids*, **130**, 58 (1991).

- 256. Mechanical Stress Relaxation in Inorganic Glasses Studied by a Step Strain Technique, R. Böhmer, H. Senapati, and C. A. Angell, *J. Non-Cryst. Solids*, 131–133, 182 (1991).
- 257. Relaxation, Glass Formation, and Rupture in Normal and Water-Like Liquids at Low Temperatures and/or Negative Pressure, C. A. Angell, in *Correlations and Connectivity; Geometrical Aspects of Chemistry and Biology*, Eds. H. E. Stanley and M. Ostrowsky, NATO-ASI series, Kluwer Academic Pub.: Norwell, MA, 1990, p 133.
- 258. Viscosity-Temperature Relations and Structure in Fully Polymerized Aluminosilicate Melts by Ion Dynamics Simulations, C. A. Scamehorn and C. A. Angell, Geochim. Cosmochim. Acta, 55, 721 (1991).
- 259. Relaxation in Liquids, Polymers and Plastic Crystals Strong/Fragile Patterns and Problems, C. A. Angell, (Text of Introductory Lecture at International Conference on Relaxation in Complex Systems), *J. Non-Cryst. Solids*, **131–133**, 13–31 (1991).
- 260. Relation of Conductivity to Structure and Structural Relaxation in Ion-Conducting Glasses, C. A. Angell and H. Senapati, in *Recent Advances in Fast Ion Conducting Materials and Devices*, Eds. B. V. R. Chowdari, Q. Liu, and L. Chen (Proceedings of the 2nd SEATO Conference on Fast Ion Conductors, Beijing, Nov. 1990), p 248.
- 261. Strong and Fragile Behavior in Liquid Polymers, C. A. Angell, L. Monnerie, and L. M. Torell, *Symp. Mater. Res. Soc.*, Ed. J. M. O'Reilly, **215**, 3–9 (1991).
- 262. Single and Two-step Calorimetry Studies of Homogeneous Nucleation and Growth Processes in Supercooled Ionic Glass-Forming Liquids: The Ca(NO<sub>3</sub>)<sub>2</sub>-KNO<sub>3</sub> System, H. Senapati, K. K. Kadiyala, and C. A. Angell, *J. Phys. Chem.*, **95**, 7050 (1991).
- 263. Vibrational Spectra in Fluoride Crystals and Glasses (Ba/Zr/F and BeF<sub>2</sub>) at Normal and High Pressures, B. Boulard, C. A. Angell, J. Kieffer, and C. C. Phifer, *J. Non-Cryst. Solids*, **140**, 350–358 (1992).
- 264. Ion-Pairing Effects on Viscosity/Conductance Relations in Raman-Characterized Polymer Electrolytes: LiClO<sub>4</sub> and NaCF<sub>3</sub>SO<sub>3</sub> in PPG(4000), M. C. McLin and C. A. Angell, J. Phys. Chem., 95, 9464 (1991).
- 265. Glass Transitions in Microemulsions, J. Teixeira, C. Alba-Simionesco, and C. A. Angell, *Prog. Colloid Polym. Sci.*, **84**, 117 (1991).
- 266. Nucleation and Crystallization Kinetics in Fragile Glass-Forming Liquids, H. Senapati and C. A. Angell, *J. Am. Ceram. Soc.*, **74**, 2659 (1991).
- 267. Covalent Bond Connectivity, Medium Range Order, and Physical Properties in TeX and TeXAs Glasses, Jacques Lucas, Hong Li Ma, X. H. Zhang, Hema Senapati, Roland Böhmer, and C. A. Angell, *J. Solid State Chem.*, 96, 181 (1992).
- 268. Diffusion Length Scales at the Glass Transition from Optical Probe Spectroscopy, A. Arzimanoglou and C. A. Angell, J. Chem. Phys. (under revision).
- 269. Correlations of the Nonexponentiality and State Dependence of Mechanical Relaxations with Bond Connectivity in Ge-As-Se Supercooled Liquids, Roland Böhmer and C. A. Angell, *Phys. Rev. B.*, 45, 10091–10094 (1992).
- 270. Elastic and Viscoelastic Properties of Amorphous Selenium: Possible Identification of the Elusive Phase Transition, R. Böhmer and C. A. Angell, *Phys. Rev. B*, **48** (9), 5857–5864 (1993).

- Connectivity, Fragility, and Non-exponentiality of Mechanical Relaxations, in Covalently Bonded Glassformers, R. Böhmer and C. A. Angell, *Mater. Sci. Forum*, 1993, 119–121, 485–490.
- 272. An ac Technique for Simultaneous Study of Local and Global Linear Responses Near the Glass Transition: the Case of Doped Ca<sup>2+</sup>/K<sup>+</sup>/NO<sub>3</sub><sup>-</sup>, R. Böhmer, E. Sanchez, and C. A. Angell, *J. Phys. Chem.* (Letters Section), **96**, 9089–9092 (1992).
- 273. Slow Processes in Viscous Liquids: Stress and Structural Relaxation, Chemical Reaction Freezing, Crystal Nucleation and Microemulsion Arrest, in Relation to Liquid Fragility, C. A. Angell, C. Alba, A. Arzimanoglou, R. Böhmer, J. Fan, Q. Lu, E. Sanchez, H. Senapati, and M. Tatsumisago, (Text of opening talk at First Tohwa University International Symposium on Slow Dynamics, Fukuoka, Japan, November 1991), *Am. Inst. Phys. Conf. Proc.*, **256**, 3–19 (1992).
- 274. Frequency-Dependent Conductivity Relaxation Times, and the Conductivity/Viscosity Coupling Problem in Polymer-Electrolyte Solutions: LiClO<sub>4</sub> and NaCF<sub>3</sub>SO<sub>3</sub> in PPO 4000, M. G. McLin and C. A. Angell, (text of keynote lecture at the eighth International Conference on Solid State Ionics, Lake Louise, October 1991). *Solid State Ionics*, **53–56**, 1027–1036 (1992).
- 275. Al and Si coordination in SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> glasses and Liquids: a Study by NMR and IR Spectroscopy and MD Simulations, B. T. Poe, P. F. McMillan, C. A. Angell, and R. K. Sato, *Chem. Geol.*, **96**, 333 (1992).
- 276. A New Problem in the Correlation of Nuclear Spin Relaxation and Ionic Conductivity in Superionic Glasses, M. Tatsumisago, C. A. Angell, and S. W. Martin, *J. Chem. Phys.*, **97**, 6968 (1992).
- 277. Signature of Ergodicity in the Dynamic Response of Amorphous Systems, R. V. Chamberlin, R. Böhmer, E. Sanchez, and C. A. Angell, *Phys. Rev. B.*, **46**, 5787 (1992).
- 278. Mobile Ions in Amorphous Solids, C. A. Angell, *Ann. Rev. Phys. Chem.*, **43**, 693 (1992).
- 279. GLASS, C. A. Angell, in *1994 Yearbook of Science and Technology*, Ed. Sybil Parker, McGraw-Hill, Inc.: New York, 1994, pp 193–195.
- 280. Rubbery Solid Electrolytes with Dominant Cationic Transport, and High Ambient Conductivity, C. A. Angell, Changle Liu, and E. Sanchez, *Nature*, **362**, 137–139, March 11, 1993.
- 281. Far IR Spectra and Heat Capacities for Propylene Carbonate and Propylene Glycol, and the Connection to the Dielectric Response, C. A. Angell, L. Boehm, M. Oguni, and D. L. Smith, *J. Mol. Liq.*, **56**, 275–286 (1993).
- 282. Liquid Fragility and the Glass Transition in Water and Aqueous Solutions, C. A. Angell, R. D. Bressel, J. L. Green, H. Kanno, M. Oguni, and E. J. Sare (Text of invited lecture at ISOPOW V) *Int. J. Food Sci.*, 22, 115–142 (1994).
- 283. Non-exponential Relaxations in Strong and Fragile Glassformers, R. Bohmer, K. L. Ngai, C. A. Angell, and D. J. Plazek, *J. Chem. Phys.*, **99** (5), 4201–4209 (1993).
- 284. A New Type of Cation-conducting Rubbery Solid Electrolyte: The Ionic Rubber, C. A. Angell, Changle Liu, and E. Sanchez, *Symp. Mater. Res. Soc.*, **293**, 75 (1993).
- 285. Conductivity vs. NMR Correlation Times, and Decoupled Cation Motion in Polymer-in-Salt Electrolytes, Jiang Fan, R. F. Marzke, and C. A. Angell, *Symp. Mater. Res. Soc.*, **293**, 87 (1993).

- 286. Water II Is A Strong Liquid, C. A. Angell, *J. Phys. Chem.*, **97** (24), 6339–6341 (1993).
- 287. Mechanical Spectroscopy of the Glassy State, C. A. Angell, Chapter in Book *Mechanical Spectroscopy*, Ed. L. Magalas, Elsevier Publ.: New York, in press.
- The Protein-Glass Analogy: Some Insights from Homopeptide Comparisons, J. L. Green, J. Fan, and C. A. Angell, *J. Phys. Chem.* 98 (51), 13780–13791 (1994).
- 289. Local and Global Relaxations in Glass-forming Materials, in *Disorder Effects on Relaxational Processes*, R. Böhmer, C. A. Angell, Eds. A. Blumen and R. Richert, Springer: Berlin, 1994, p 11.
- 290. Conductivity and Nuclear Spin Relaxation in Superionic Glasses, Polymer Electrolytes, and the New Polymer-In—Salt Electrolyte, J. Fan, R. F. Marzke, E. Sanchez, and C. A. Angell, *J. Non-Cryst. Solids*, **172**—**174**, 1178—1189 (1994).
- 291. Hydrogen Bonding and the Fragility of Supercooled Liquids and Biopolymers, C. A. Angell, C. Alba Simionesco, J. Fan, and J. L. Green, (text of opening talk at NATO Conference on Hydrogen Bonded Liquids, Cargese, Corsica, Sept., 1993), *NATO-ASI Series C* (Math, and Phys., Sci), **435**, 3–22.
- 292. Novel Features in the Equation of State of Metastable Water, P. H. Poole, F. Sciortino, U. Essmann, M. Hemmati, H. E. Stanley, and C. A. Angell, Proceedings of NATO ARW Hydrogen Bond Networks, Cargese, France, August, 1993, *NATO-ASI Series C* (Math, and Phys., Sci) **435**, p. 53–60.
- 293. Is there a Second Critical Point in Water? H. E. Stanley, C. A. Angell, U. Essman, M. Hemmati, P. H. Poole, and F. Sciortino, *Physica A* 205, 122 (1994).
- 294. Subambient T<sub>g</sub> Glasses for Ionic Rubbers and New Generation Solid Electrolytes, (text of plenary lecture), Changle Liu, E. Sanchez, and C. A. Angell, 1994, Chimica Chronica, New Series, 23, 211–220 (1994).
- 295. (a) Nitride Glasses Obtained by High-Pressure Synthesis, T. Grande, J. R. Holloway, P. F. McMillan, and C. A. Angell, *Nature*, 369, 43–45 (1994). (b) High-Pressure Synthesis of Nitride Glasses, T. Grande, S. Jacob, J. R. Holloway, P. F. McMillan, and C. A. Angell, *J. Non-Cryst. Solids*, 184, 151 (1995).
- 296. Diffusion in Amorphous Solids: Some General Features, J. Shao and C. A. Angell, Chapter in Book *Diffusion in Amorphous Materials*, Eds. H. Jain and D. Gupta, The Minerals, Metals and Materials Society of America, 1994, pp 1–16.
- 297. Li-conducting Ionic Rubbers for Lithium Battery and Other Applications, C. Austen Angell, Jiang Fan, Changle Liu, Eduardo Sanchez, and Kang Xu, *Solid State Ionics*, **69**, 343–353 (1994).
- 298. Glasses With Strong Calorimetric  $\beta$ -Glass Transitions, and the Relation to the Protein Glass Transition Problem, J. Fan, E. I. Cooper, and C. A. Angell, *J. Phys. Chem.*, **98**, 9345 (1994).
- 299. Effect of Hydrogen Bonds on the Thermodynamic Behavior of Liquid Water, P. H. Poole, F. Sciortino, T. Grande, H. E. Stanley, and C. A. Angell, *Phys. Rev. Lett.*, **73**, 1632–1635 (1994).
- 300. Formation of Glasses from Liquids and Biopolymers, C. A. Angell, *Science*, **267**, 1924 (1995).
- Glassforming Liquids, Anomalous Liquids, and Polyamorphism in Liquids and Biopolymers, C. A. Angell, P. H. Poole, and J. Shao, *Nuovo Cimento*, 16D, 993 (1994).

- 302. The Old Problems of Glass and the Glass Transition, and the Many New Twists, C. A. Angell, *Proc. Natl. Acad. Sci.*, **92**, 6675–6682 (1995).
- Non-Crystallizing Molten Salt and Ionic Rubber Electrolytes with Wide Electrochemical Windows, K. Xu and C. A. Angell, *Symp. Mater. Res. Soc.*, 369, 505 (1995).
- Fast and Slow Relaxation Processes in Polymer Electrolytes, R. Bergman, A. Brodin, D. Engberg, Q. Lu, C. A. Angell, and L. M. Torell, *Electrochim. Acta*, 40, 2049 (1995).
- Rubbery Behavior from Low Molecular Weight Polymers Using High Field Cation Endlinkers, Q. Lu, E. Sanchez, and C. A. Angell, *Electrochim. Acta*, 40, 2239 (1995).
- 306. The Preparation, Conductivity, Viscosity, and Mechanical Properties of Polymer Electrolytes and New Hybrid Ionic Rubber Electrolytes, J. Fan and C. A. Angell, Electrochim. Acta, 40, 2397 (1995).
- 307. Synthesis and Characterization of Lithium Sulfonates as Components of Molten Salt Electrolytes, Kang Xu and C. A. Angell, *Electrochim. Acta*, **40**, 2401 (1995).
- Crystalline-Amorphous Transition in Silicate Perovskites, M. Hemmati, A. Chizmeshya, G. H. Wolf, P. H. Poole, J. Shao, and C. A. Angell, *Phys. Rev. B*, 51, 14,841 (1995).
- 309. Viscosity of Salt-in-Polymer Solutions Near the Glass Transition by Penetrometry Studies, M. G. McLin, and Angell, C. A. *Polymer*, **37**, 4713 (1996).
- 310. Why C<sub>1</sub> = 16–17 in the WLF Equation is Physical and the Fragility of Polymers, C. A. Angell, *Polymer*, **38** (26), 6261 (1997).
- 311. Vibrational anharmonicity and the glass transition in strong and fragile vitreous polymorphs, J. Shao and C. A. Angell, *Proc. XVIIth Internat. Congress on Glass*, Beijing, 1995, Vol. 1, p. 311.
- 312. Crystal Stability Limits at Positive and Negative Pressures and the Crystal-to-Amorphous Transition, F. Sciortino, U. Essman, H. E. Stanley, M. Hemmati, J. Shao, G. H. Wolf, and C. A. Angell, *Phys. Rev. E*, **52**, 6484 (1995).
- 313. Probe Ion Diffusivity Measurements in Salt-in-Polymer Electrolytes; Stokes Radii, and the Transport Number Problem, M. G. McLin, and C. A. Angell, *J. Phys. Chem.*, **100**, 1181–1188 (1996) (Honor issue for Harold Friedman).
- 314. Simulation of Glasses and Glassforming Liquids After Two Decades: Some Perspectives, C. A. Angell, *Comput. Mater. Sci.*, **4**, (1995) 285.
- 315. Relaxational Transitions and Ergodicity Breaking Within the Fluid State: the Sugars Fructose and Galactose, J. Fan and C. A. Angell, *Thermochim. Acta*, **280**, 523 (1996).
- 316. Glass Transitions and First-Order Liquid-Metal-to-Semiconductor Transitions in 4-5-6 Covalent Systems, C. A. Angell, S. Borick, and M. Grabow, *J. Non-Cryst. Solids*, **205–207**, 463–471 (1996).
- 317. Vitrification of Trehalose by Water Loss from its Crystalline Dihydrate, S.-P. Ding, J. Fan, J. L. Green, Q. Lu, E. Sanchez, and C. A. Angell, *J. Therm. Anal.* **47**, 1391–1405 (1996).
- 318. Variations on the Salt-Polymer Electrolyte Theme for Flexible Solid Electrolytes, C. A. Angell, K. Xu, S-S. Zhang, and M. Videa, (Takahashi Memorial Symposium), *Solid State Ionics*, **86–88**, 17–28 (1996).

- 319. Supercooled Liquids and Glasses, M. D. Ediger, C. A. Angell, and Sidney R. Nagel, invited for Centenntial Issue, *J. Phys. Chem.*, **100**, 13200 (1996).
- 320. Polyamorphism and First-Order Transitions Between Strong and Fragile Liquid States, C. A. Angell, J. Shao, and M. Grabow, text of Plenary Lecture, in *Non equilibrium phenomena in supercooled fluids, glasses and amorphous materials*, Eds. M. Giordano, D. Leporini, and M. P. Tosi, World Scientific: Singapore, 1996, pp 50–57 (*Proc. Workshop on Dynamics of Liquids and Glasses*, Pisa, Italy, Sept. 25–29, 1995).
- 321. The Structure of a Boron Oxyfluoride Glass, an Inorganic Cross-Linked Chain Polymer, C. Boussard-Plédel, M. Le Floch, G. Fonteneau, J. Lucas, S. Sinbandhit, J. Shao, C. A. Angell, Joël Emergy, and J. Y. Buzaré, *J. Non-Cryst. Solids*, **209**, 247 (1997).
- 322. Phase Equilibria, High Conductivity Ambient Temperature Liquids, and Glasses in the Pseudo-Halide Systems AlCl<sub>3</sub>-MSCN (M = Li, Na, K), Changle Liu and C. A. Angell, *Solid State Ionics*, **86–88**, 467–473 (1996).
- 323. Room-Temperature Inorganic 'Quasi-Molten Salts' as Alkali-Metal Electrolytes, K. Xu, S-S. Zhang, C. A. Angell, *J. Electrochem. Soc.*, **143**, 3548–3554 (1996).
- 324. A Novel Electrolyte Solvent for Rechargeable Lithium and Lithium-Ion Batteries, S-S. Zhang and C. A. Angell, *J. Electrochem. Soc.*, **143**, 4047 (1996).
- 325. Inorganic Electrolyte Solutions and Gels for Rechargeable Lithium Batteries, K. Xu, N. D. Day, and C. A. Angell, *J. Electrochem. Soc.*, **143**, L209–L211 (1996).
- 326. Current Opinion on the Glass Transition, C. A. Angell, *Curr. Opin. Solid State Mater. Sci.*, **1** (4), 578–585 (1996).
- 327. Relations Between Unusual Thermodynamic Properties of Liquid Silica and Water, P. H. Poole, M. Hemmati, and C. A. Angell, *Phys. Rev. Lett.*, **79**, 2281, (1997).
- 328. Strong and Fragile Liquids; Glass Transitions and Polyamorphic Transitions in Covalently Bonded Glassformers, C. A. Angell, in *Amorphous Insulators and Semiconductors*, Eds. M. F. Thorpe and M. I. Mitkova, NATO-ASI Series, Plenum Press: New York, 1997, pp 1–20.
- 329. Entropy and Fragility in Supercooling Liquids, C. A. Angell, APS Symposium Proceedings, *J. Res. NIST*, **102**, 171 (1997).
- IR Absorption of Silicate Glasses by IDCS: I. IR Spectra of SiO<sub>2</sub> Glass in the Rigid Ion Model Approximation, M. Hemmati and C. A. Angell, *J. Non-Cryst. Solids*, 217, 236–249 (1997).
- 331. Polarization Effects, Network Dynamics, and the Infrared Spectrum of Amorphous SiO<sub>2</sub>, M. Wilson, P. A. Madden, M. Hemmati, and C. A. Angell, *Phys. Rev. Lett.*, 77, 4023 (1996).
- 332. Finite Size Effects in Computer Simulations of the Dynamics of Strong Glass Formers, J. Horbach, W. Kob, K. Binder, and C. A. Angell, *Phys. Rev. Rapid Pub. E.*, 54, 5897 (1996).
- 333. Glassforming Liquids with Microscopic to Macroscopic Two-State Complexity, C. A. Angell, in Dynamics of Glass Transition and Related Topics, Eds. T. Odagaki, Y. Hiwatari, and J. Matsui. *Prog. Theor. Phys. Supplement No.* 126, 1 (1997) (Yukawa seminar, Nov. 1996).
- 334. Polymorphism in Liquids and Glasses, P. H. Poole, Tor Grande, C. A. Angell, and P. F. McMillan, *Science*, **275**, 322–323, Jan. 17, 1997.

- 336. The Viscous Liquid/Glassy Solid Problem, C. A. Angell, Chapter in *Supercooled Liquids: Advances and Novel Applications*, Eds. J. Fourkas, D. Kivelson, U. Mohanty, and K. Nelson, ACS Symposium Series 676; American Chemical Society: Washington, D.C., 1997.
- 337. Polyamorphic Transitions in Network Forming Liquids and Glasses, J. L. Yarger, C. A. Angell, S. S. Borick, and G. H. Wolf, Chapter in *Supercooled Liquids: Advances and Novel Applications*, Eds. J. Fourkas, D. Kivelson, U. Mohanty, and K. Nelson; ACS Symposium Series 676; American Chemical Society: Washington, D.C., 1997.
- 338. The Glassy State Problem: Failure to Crystallize, and Vitrification, C. A. Angell, Proc. Int. School of Physics, Enrico Fermi Course CXXXIV, Eds. F. Mallamace and H. E. Stanley, IOS Press: Amsterdam, 1997, p 571.
- 339. Ionic Transport and Heat Capacity of Glass-Forming Metal-Nitrate Mixtures, A. Pimenov, P. Lunkenheimer, M. Nicklas, R. Bohmer, A. Loidl, and C. A. Angell, J. Non-Cryst. Solids, 220, 93–101 (1997).
- 340. Radiation effects in glasses used for immobilization of high-level waste and plutonium disposition, W. J. Weber, R. C. Ewing, C. A. Angell, G. W. Arnold, A. N. Cormack, J. M. Delaye, D. L. Griscom, L. W. Hobbs, A. Navrotsky, D. L. Price, A. M. Stoneham, and M. C. Weinberg, J. Mater. Res., 12 (8), Aug. 1997.
- Entropy, Fragility, "Landscapes", and the Glass Transition,
   C. A. Angell, in *Complex Behavior of Glassy Systems*,
   Ed. M. Rubi, Springer: New York, 1997, p 1.
- Thermodynamic Aspects of the Glass Transition Phenomenon II. Molecular Liquids with Variable Interactions, C. Alba, J. Fan, and C. A. Angell, *J. Chem. Phys.*, 110, 5262 (1999).
- 343. A New Interpretation of Liquid—Liquid Unmixing in Classical Alkali Silicate Glasses, C. A. Angell, P. H. Poole, and M. Hemmati, Proceedings of the 12th East European Glass Conference (Varna, Bulgaria), Eds. B. Samunova and Y. Demetriew, 1998, pp 100—109.
- 344. High Anodic Stability of a New Electrolyte Solvent: Unsymmetric Non-Cyclic Aliphatic Sulfone, K. Xu and C. A. Angell, *J. Electrochem. Soc.*, **145**, L70 (1998).
- 345. Entropy, Landscapes, and Fragility in Liquids and Polymers, and the  $\Delta C_{\rm p}$  Problem, C. A. Angell, in *Structure and Properties of Glass Polymers*, ACS Symposium Series 710, Eds. M. Tant and A. Hill, American Chemical Society: Washington, DC, 1998, p 37.
- 346. The Nature of Glassforming Liquids, the Origin of Superionics and "Tight" vs. "Loose" Glassy Conductors, C. A. Angell, *Solid State Ionics*, **105**, 15–24 (1998).
- 347. Comparison of Pair Potential Models for the Simulation of Liquid SiO<sub>2</sub>: Thermodynamic and Diffusional Properties, M. Hemmati and C. A. Angell, *Physics meets Geology*, Eds. H. Aoki and R. Hemley, Cambridge University Press: New York, in press.
- 348. Dynamics of Glassforming Liquids. IV: On the Link between Molecular Dynamics and Configurational Entropy, R. Richert and C. A. Angell, *J. Chem. Phys.*, **108**, 9016 (1998).

- 349. Liquid Landscapes C. A. Angell, *Nature* (News & Views), 393, 521 (1998).
- 350. The thermodynamic determination of fragility in liquids, and a fragile-to-strong liquid transition in water, K. Ito, C. T. Moynihan, and C. A. Angell, *Nature*, **398**, 492 (1999).
- 351. Rigidity, Fragility, and the Energy Landscape for Covalent Glassformers, C. A. Angell, in *Rigidity Theory and Applications*, Eds. M. F. Thorpe and P. M. Duxbury, Kluwer Academic/Plenum Publishers: New York, 1999, pp 297–314.
- 352. Rubbery Electrolytes, C. A. Angell, Ed. H. Wendt, *Molten Salt Forum*, **5–6**, 39–42 (1998).
- 353. From simple electrolyte solutions through polymer electrolytes to superionic rubbers: Some fundamental considerations, C. A. Angell, C. T. Imrie, and M. D. Ingram, *Polymer Int.* **47**, 9–15 (1998).
- 354. Glasses and glass formation, Chapter 1 in *Insulating and Semi-conducting Glasses*, Ed. P. Boolchand, in press.
- 355. Comment on Structure of Supercooled Liquid Silicon by Ansell et al. C. A. Angell and S. Borick, *J. Phys.: Condens. Matter*, in press.
- 356. Fragility in Liquids and Polymers: New Simple Quantifications and Interpretations, J. L. Green, K. Ito, K. Xu, and C. A. Angell, *J. Phys. Chem. B*, 103, 3991 (1999).
- 357. Relaxation in Glassforming Liquids and Amorphous Solids: A Report on a Workshop Sponsored by DOE-BES, C. A. Angell, K. L. Ngai, G. B. McKenna, P. F. McMillan, and S. W. Martin, *Rev. Appl. Phys.*, in press.
- 358. Competitive Interactions and Glassy State Extension in Lithium Salt, A. Sivaraman, H. Senapati, and C. A. Angell, *J. Phys. Chem. B*, **103**, 4159 (1999).
- 359. Simple Glassformers: Their Definition, Fragilities and Landscape Excitation Profiles, C. A. Angell, B. E. Richards, and V. Velikov, special issue of *J. Phys. Condens. Matter*, **11**, 1–20 (1999).
- 360. Glass Formation, Ionic Conductivity, and Conductivity/ Viscosity Decoupling, in LiAlCl<sub>4</sub> + LiClO<sub>4</sub> and LiAlCl<sub>4</sub> + LiAlCl<sub>3</sub>.imide Solutions, M. Videa and C. A. Angell, *J. Phys. Chem. B*, **103**, 4185 (1999).
- 361. Glassformer Fragilities and Landscape Excitation Profiles by Simple Calorimetric and Theoretical Methods, C. A. Angell, K. Ito, B. E. Richards, and P. Lucas, *J. Therm. Anal.*, in press.
- 362. Relaxation in Glassforming Liquids and Amorphous Solids: A Report on a Workshop Sponsored by DOE-BES, C. A. Angell, K. L. Ngai, G. B. McKenna, P. F. McMillan, and S. W. Martin, Rev. Appl. Phys., in press.
- 363. Glass Transitions and Folding Transitions in Complex Systems, C. A. Angell, in *Hydration Processes in Biology*, Ed. M.-C. Bellisent-Funel, NATO-ASI Series, Plenum Press: New York, 1999, in press.
- 364. Molecular and Anionic Polymer Systems with Micro-Decoupled Conductivities, S.-S. Zhang, Z. Chang, K. Xu, and C. A. Angell, *Electrochim. Acta*, in press.
- 365. Protonation Chemistry of Phosphazenes and the Formation of Bis(sulfonyl)imides, K. Xu, N. D. Day, and C. A. Angell, *Inorg. Chem. Commun.*, in press.
- 366. Ideal and Cooperative Bond Lattice Representations of Excitations in Glassforming Liquids: Excitation Profiles, Fragilities, and Phase Transistions, C. A. Angell and C. T. Moynihan, *Met. Trans.*, in press.