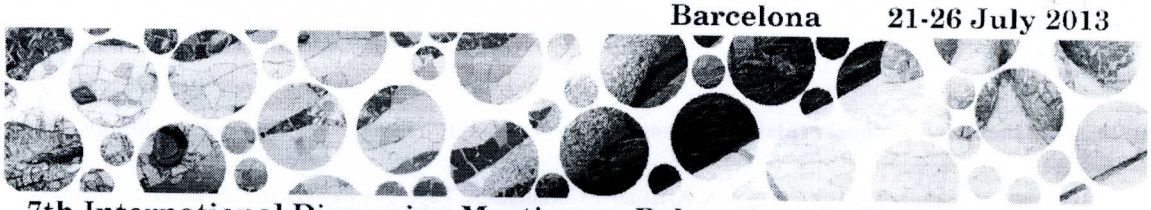

7th International Discussion Meeting on Relaxations in Complex Systems

New results, Directions and Opportunities

Book of Abstracts

Universitat Politècnica de Catalunya
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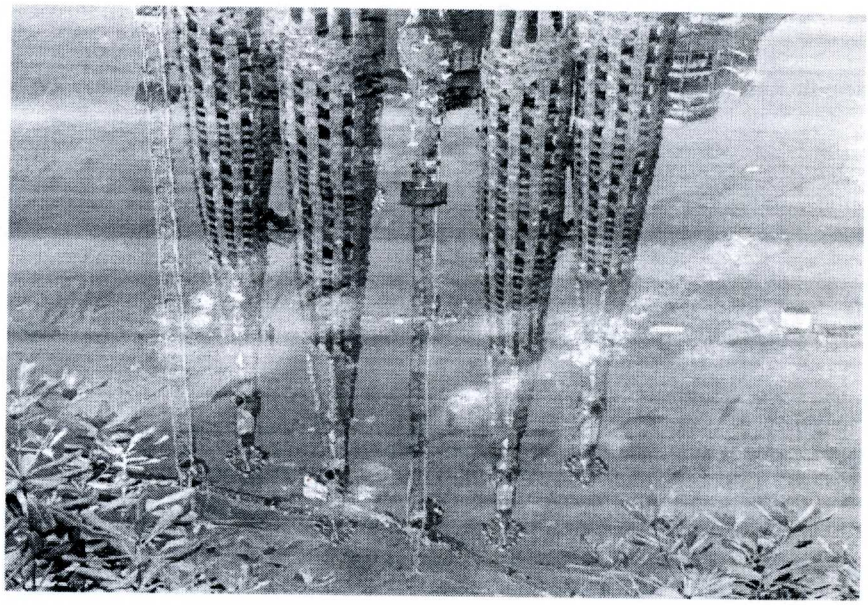

Invited talk

D-ND-9

Can the shoving model explain the observed non-Arrhenius behavior of glass-forming liquids?

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The shoving model [1,2] is a simple model of the non-Arrhenius temperature dependence of the structural relaxation time (or viscosity) linking the relaxation time to instantaneous shear modulus. The model does not predict divergence of the relaxation time at finite temperatures in so far as the instantaneous shear modulus and the characteristic volume (which is of the order of the molecular volume [3,4]) of the model remains finite. We review the current status of the shoving model experimentally, including tests of the model in equilibrated molecular liquids [5-9], metallic glasses [10], and glasses undergoing aging [11,12].

[1] J. C. Dyre, N. B. Olsen, and T. Christensen, Phys. Rev. B **53**, 2171 (1996).
[2] J. C. Dyre and N. B. Olsen, Phys. Rev. E **69**, 042501 (2004).
[3] B. Xu and G. B. McKenna, J. Chem. Phys. **134**, 124902 (2011)
[4] T. Hecksher, N. B. Olsen, K. A. Nelson, J. C. Dyre, and T. Christensen, accepted in J. Chem. Phys.
[5] J. C. Dyre, T. Christensen, and N. B. Olsen, J. Non-Cryst. Sol. **352**, 4635 (2006).
[6] C. Maggi, B. Jakobsen, T. Christensen, N. B. Olsen, and J. C. Dyre, J. Phys. Chem. B **112**, 16320 (2008).
[7] D. H. Torchinsky, J. A. Johnson, and K. A. Nelson, J. Chem. Phys. **130**, 064502 (2009).
[8] K. Niss, C. Dalle-Ferrier, B. Frick, D. Russo, J. C. Dyre, and C. Alba-Simionesco, Phys. Rev. E **82**, 021508 (2010).
[9] C. Gainaru, T. Hecksher, N. B. Olsen, R. Böhmer, and J. C. Dyre, J. Chem. Phys. **137**, 064508 (2012).
[10] J. C. Dyre and W.-H. Wang, J. Chem. Phys. **136**, 224108 (2012).
[11] N. B. Olsen, J. C. Dyre, and T. Christensen, Phys. Rev. Let. **81**, 1031 (1998).
[12] M. Potuzak, X. Guo, M. M. Smedskjaer, and J. C. Mauro, J. Chem. Phys. **138**, 12A501 (2013).

Poster

D-ND-101

Below-Tg structural relaxation in network glass-formers: nonlinear time series analysis of chaotic behavior in glassy As-Se

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(1) Scientific Research Company ¿Carat¿; (2) Lehigh University; (3) Yeditepe University; (4) Lviv State University of Vital Activity Safety; (5) Opole Technical University

Theory of strange attractors tested previously for typical polymer-based systems (polymethylmethacrylate and polyethylene glycol) [1,2] is shown to be adequately applied to analyze the kinetics of structural relaxation in Se-rich As-Se glasses below T_g [3]. Kinetics of enthalpy losses induced by prolonged dark storage in natural conditions (natural physical ageing) or exposure with light of different discrete wavelengths near fundamental absorption edge rigion (light-assisted physical ageing) are used to determine phase space reconstruction parameters. The observed chaotic behaviour (involving chaos and fractal analysis such as detrended fluctuation analysis, attractor identification using phase space representation, delay coordinates, mutual information, false nearest neighbors) reconstructed via TISEAN program package [4] is treated as a diversity of possible transitions between different basins/metabasins towards more thermodynamically equilibrium states, minimizing free energy of the system.

[1] A. Hacinliyan, Y. Skarlatos, G. Sahin, G. Akin, Chaos, Solitons and Fractals **17** (2003) 575.
[2] K. Atak, O.O. Aybar, G. Sahin, A. Hacinliyan, Y. Skarlatos, Cent. Eur. J. Phys. **7** (2009) 568.
[3] R. Golovchak, A. Kozdras, V. Balitska, O. Shpotyuk, J. Phys.: Condens. Matter **24** (2012) 505106.
[4] R. Hegger, H. Kantz, T. Schreiber, Chaos **9** (199) 413.