

PhD Dissertation Defense of Coralie BRUN

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IRAMIS/CEA-Saclay

Wednesday, September 28th, 2011 at 14h15

Amphitheater C. Bloch, Bât 774, Orme de Merisiers, CEA-Saclay

From supercooled liquids to glasses: A study of correlations in and out of equilibrium

Abstract: Upon fast enough cooling, a liquid avoids crystallization and enters in a supercooled state. The relaxation time τ_α of this supercooled liquid increases extremely fast when the temperature decreases towards the glass transition temperature T_g . Below T_g , the system is in the glassy state. It ages: τ_α increases with time. The existence of a growing correlation length associated to the slowing down of supercooled liquids (or of glasses) is one of the main open issues in the physics of the glass transition. On very general theoretical arguments, it has been shown that the third order a.c. nonlinear susceptibility around T_g gives direct access to the dynamical correlation length ξ_{dyn} . We have developed a high sensibility experiment to measure, close to T_g , two nonlinear dielectric susceptibilities of the third order. Our results performed on supercooled glycerol are quantitatively in very good agreement with theoretical predictions. They show that ξ_{dyn} increases when T decreases towards T_g . Below T_g , aging experiments of one of the nonlinear susceptibilities reveal that ξ_{dyn} increases with time. These results clearly evidence the collective character of glassy dynamics and reinforce the picture of an underlying critical point, which would explain the ubiquity of the glass transition in Nature.

Keywords: Glass transition, supercooled liquid, glass, aging, dynamic heterogeneities, dynamic correlations, dielectric susceptibility, nonlinear measurements.

N.B. The oral defense will be conducted in French.

You are cordially invited to attend the oral defense and the cocktail reception that follows.

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Direction to Orme de Merisiers: <http://iramis.cea.fr/spec/Contact/visitSPEC.php>