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structural signature of glass transition

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Is there a static, structural origin of the dramatic slowing down of dynamics in supercooled liquids? The answer to this question will ultimately change our understanding of the physics of glasses and tell us whether the unique transport and mechanical properties of amorphous solids arise from a truly new phase of matter, instead of mere slow kinetics. A few recent findings give novel indications of a growing static correlation length, as several theories had indeed assumed. This puts the issue of the thermodynamic nature of glass transition at the center of the scientific debate again. Here we give evidence of a clear structural signature of the glass transition, in terms of a static correlation length with the same dependence on the system size which is typical of critical phenomena. Our approach is to introduce an external, static perturbation to extract the structural information from the system's response. In particular, we consider the transformation behavior of the local minima of the underlying potential energy landscape (inherent structures), under a static deformation. The finite-size scaling analysis of our numerical results indicate that the correlation length diverges at a temperature T_c , below the temperatures where the system can be equilibrated. These results show a clear structural signature of the glass transition.

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