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## Effect of pressure on time and length scales of molecular dynamics in the density scaling regime

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Our thorough analyses of high pressure experimental data of various glass formers that belong to different material groups (such as van der Waals supercooled liquids, polymer melts, and supercooled ionic liquids) clearly show that some previous suppositions concerning interrelations between time and length scales of molecular dynamics near the glass transition require revisiting. This is a straightforward consequence of a phenomenon of isochronal decoupling observed by us [1-3] between time and dynamic length scales of molecular dynamics, which have been determined using the structural relaxation time  $\tau$  and the maximum of the four-point dynamic susceptibility function  $\chi_4^{\text{max}}$ . At first glance, these results seem to be disadvantageous to perspectives of finding a simple universal description of the glass transition and related phenomena. However, a very successful application of proper density scaling law to the decoupling phenomena yields a very positive outcome of our investigations. What is more, very recently, we have established [4] an analogous pattern of the density scaling behavior for the total system entropy  $S$  defined thermodynamically and the excess entropy  $S_{\text{ex}}$  defined in the way employed in the theory of isomorphs as a difference between  $S$  and the entropy of an ideal gas at the same density and temperature. As a consequence, the phenomena of isochronal decoupling between  $\tau$ ,  $\chi_4^{\text{max}}$ ,  $S$ , and  $S_{\text{ex}}$  explored by us using high pressure experimental data can be described by a general relation  $\tau = h_X(\rho \Delta_X \gamma_w X)$  with  $\Delta_X \gamma = \gamma - \gamma_X$ , where  $X = \tau, \chi_4^{\text{max}}, S$ , and  $S_{\text{ex}}$ . The relation clearly shows that the time scale  $\tau$  of molecular dynamics cannot be in general any unique function of  $X$  ( $= \chi_4^{\text{max}}, S$ , and  $S_{\text{ex}}$ ). To formulate such a proper function  $h_X$  in case of real glass formers, an additional density dependent factor is required. In the power law density scaling regime, the factor is a power density function, the exponent of which is a difference between the scaling exponents  $\gamma$  and  $\gamma_X$  and can be considered as a good measure of the isochronal decoupling between the time scale of molecular dynamics  $\tau$  and the physical quantity  $X$ .

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**Primary author:** Dr GRZYBOWSKI, Andrzej (Institute of Physics, University of Silesia)

**Co-authors:** Mr KOPERWAS, Kajetan (Institute of Physics, University of Silesia); Dr GRZYBOWSKA, Katarzyna (Institute of Physics, University of Silesia); Prof. PALUCH, Marian (Institute of Physics, University of Silesia)

**Presenter:** Dr GRZYBOWSKI, Andrzej (Institute of Physics, University of Silesia)

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