Dyre and Olsen [1] report a key experiment for the understanding of the glass transition, separating for the first time the influence of the real temperature $T$ (the phonon bath temperature) and the fictive temperature $T_f$ (the temperature characterizing the thermodynamic state of the system) on the Johari-Goldstein relaxation peak of a molecular glass former. They find two surprising results: (i) an instantaneous increase of the damping at the peak on heating, indicating a strong asymmetry $\Delta$ of the potential minima of the relaxing units (ii) a decrease of the peak frequency on the subsequent equilibration, indicating an increase of the potential barrier between the minima with increasing fictive temperature.

But one can also understand the experiment without these counterintuitive assumptions of strong asymmetry and barrier increase. A recent model by one of us [2] attributes the damping to relaxing units distributed around the asymmetry zero with a probability proportional to the Boltzmann factor $\cosh(\Delta/2k_B T_f)$.

In order to obtain the barrier density $f_0(V)$ at the barrier height $V$, one has to integrate over the asymmetry with the weight factor $1/\cosh^2(\Delta/2k_B T_f)$. It is easy to convince oneself that the above probability leads to $f_0(V) \sim T$ at constant $T_f$, at least as long as $T$ is not too different from $T_f$.

In addition, the model takes the elastic dipole interaction between different relaxing entities into account. Combining eqs. (6) and (7) of [2]

$$f(V) = \frac{f_0(V)}{\left[1 - 3 \int_0^V f_0(v) dv \right]^{2/3}}. \quad (1)$$

The enhancement of the measured barrier density $f(V)$ over the true density $f_0(V)$ is due to all barriers lower than $V$. It increases with increasing barrier height, and thus shifts the Johari-Goldstein peak to higher barriers, as shown in Fig. 1. Both the enhancement and the peak shift - this is the main point of the Comment - increase with increasing relaxator density $f_0(V)$.

We model the experiment [1] by a Johari-Goldstein peak in $f_0(V)$. Since the damping is $\sim T f(V)$ and $f_0(V)$ is proportional to temperature at constant $T_f$, the damping $\sim T^{2+\delta}$, where $\delta$ comes from the enhancement factor in eq. (1). From experiment, $\delta = 0.6$. One fits this requirement by the lorentzian in $f_0(V)$ shown in Fig. 1, thus explaining the first surprising feature of the experiment.

The second surprising feature - the decrease of the relaxation peak frequency on equilibration to a higher fictive temperature - is explained by the increase of the damping, which shifts the peak in $f(V)$ to higher barriers. As it turns out, $f_0(V) \sim T_f^{7/9}$ describes both the long-time damping increase (Fig. 1 (b) of [1]) and the long-time peak frequency shifts (Fig. 3 of [1]).

This explanation does not require any unexpected properties of the energy landscape. One only needs the theoretical concept of independent relaxing entities, weakly coupled by the elastic dipole interaction.

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[1] Jeppe C. Dyre and Niels Boye Olsen, Phys. Rev. Lett. 91, 155703 (2003)

[2] U. Buchenau, cond-mat/0202036 Phil. Mag. B (in press)