Electronic Supplementary Information (ESI)

Identity of the local and macroscopic dynamic elastic responses in supercooled 1-propanol

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The measured macroscopic shear modulus spectra were fitted to a network α-β model [1], where the α and β process are added in the compliance. This gives the correct limiting low-frequency behavior [1, 2]. The model's complex shear compliance, $J(\omega) = 1/G(\omega)$, is given by

$$J(\omega) = J_\alpha \left(1 + \frac{1}{i\omega\tau_\alpha} + \frac{k_1}{1 + k_2(i\omega\tau_\alpha)^{1/2}} \right) + \frac{J_\beta}{1 + (i\omega\tau_\beta)^b} ,$$

(S1)

where the α part is an extended BEL/Maxwell model, and the β part is a Cole-Cole function. The model has three shape parameters: k_1 and k_2 for the α process and b (the stretching parameter) for the β process. Non dimensionless fitting parameters are the relaxation time τ_x and amplitude J_x for each process x.

The shape of α and β process were assumed to be temperature independent. The values of shape parameters were found by fitting a low temperature spectrum (where the two processes are well separated) with all parameters varying freely. The values for the shape parameters obtained and used for all spectra were: $k_1 = 7.78$, $k_2 = 4.44$, and $b = 0.505$. Subsequently, all spectra were fitted keeping the shape parameters fixed at these values, varying only the relaxation times and amplitudes. Data with fits are shown in Fig. 2.
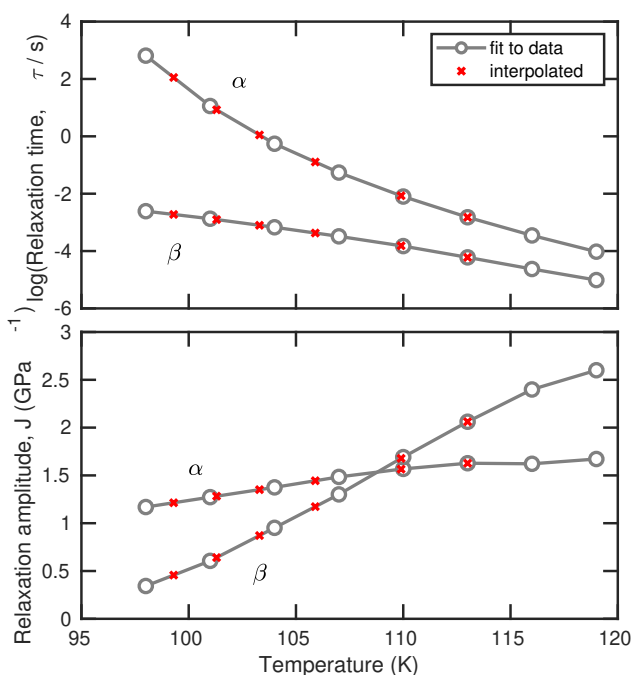

FIG. S1. Fitted and interpolated parameters. The α-β model (Eq. (S1)) was fitted to the measured shear-modulus data. The red crosses mark the interpolated values at the temperatures of the TSD measurement.

Figure S1 shows the fitted relaxation times and amplitudes as well as the interpolated values. The fitted values vary monotonically with temperature and thus the interpolations should be meaningful. For comparison, the curves resulting from the interpolated values are shown in Fig. S2 along with measured data.
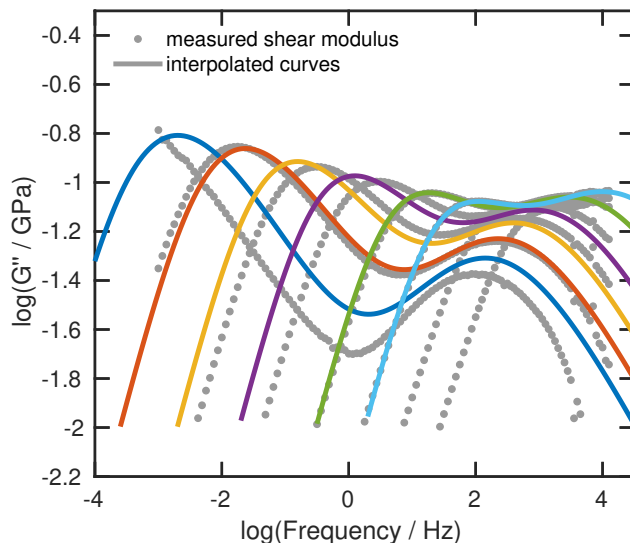
FIG. S2. Dynamic shear-modulus data and interpolated curves to fit the temperatures of the TSD measurements. The predicted curves are based on the α-β model with the interpolated values from Fig. S1.
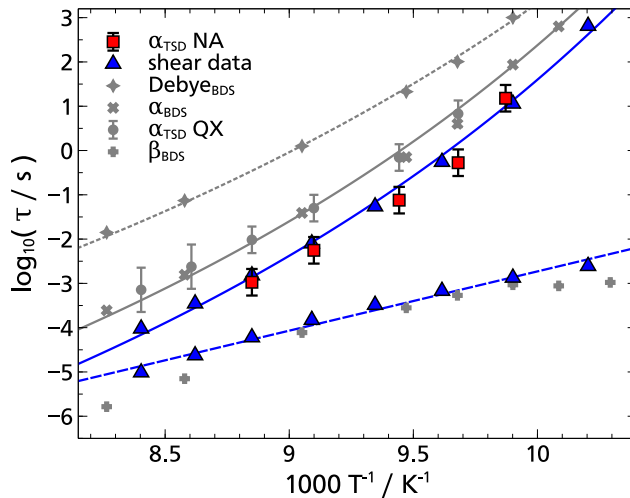

FIG. S3. Relaxation times of 1-propanol, plotted as a function of inverse temperature (same data as in Fig. 3). The results from the analysis of the TSD and shear data are shown together with dielectric and polar solvation data from Ref. 3.

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[2] B. Jakobsen, K. Niss, C. Maggi, N. B. Olsen, T. Christensen, and J. C. Dyre, Journal of Non-Crystalline Solids **357**, 267 (2011).
[3] P. Weigl, D. Koestel, F. Pabst, J. P. Gabriel, T. Walther, and T. Blochowicz, Physical Chemistry Chemical Physics **21**, 24778 (2019).