

Sanz et al. Reply

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Sanz *et al.* Reply: In Ref. [1] we reported that the density-scaling exponent γ for the silicone oil DC704 is state-point dependent within the reported statistical accuracy (Fig. 2(b) in Ref. [1]). An error in the measurements of the pressure fragility m_T^p at the lowest temperature (218 K) has been pointed out in the preceding Comment by Ransom *et al.* [2]. After repeating the measurements at 218 K we obtain results in agreement with the findings of Ransom *et al.* The error in the original measurement originated from insufficient equilibration at the lowest temperature due to extremely long flow times in the narrow capacitor gap (this is not an issue at higher temperatures). As a consequence, we underestimated the value of m_T^p in the analysis, leading to a too low value of γ at 218 K and ambient pressure. Figure 1 shows the recomputed γ . In agreement with the Comment by Ransom *et al.*, the value is constant within the uncertainty.

Our original conclusions that γ of DC704 is state-point dependent was based on a single data point. In hindsight, the situation illustrates well Feynman's point [3] that "... there's a principle that a point on the edge of the range of the data—the last point—isn't very good, because if it was, they'd have another point further along."

The error does not alter the main conclusion of Ref. [1] that the density-scaling exponent is generally not constant throughout the thermodynamic phase diagram. Thus, based on literature data Fig. 3(b) in Ref. [1] demonstrates a state-point-dependent density-scaling exponent for at least ten metallic elements.

In conclusion, a nonconstant γ for DC704 at the investigated state points cannot be concluded from our data. We have only investigated γ at ambient pressures. There is no theoretical reason to expect γ to be constant throughout the thermodynamic phase diagram; in view of this it would be most interesting to investigate whether γ remains constant at elevated pressures.

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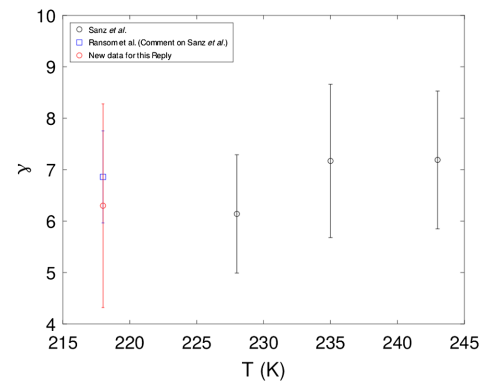


FIG. 1. Density-scaling exponent of DC704 calculated by means of Eq. (7) in the original article [1], plotted as a function of temperature at ambient pressure.

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- [1] A. Sanz, T. Hecksher, H. W. Hansen, J. C. Dyre, K. Niss, and U. R. Pedersen, Experimental Evidence for a State-Point-Dependent Density-Scaling Exponent of Liquid Dynamics, *Phys. Rev. Lett.* **122**, 055501 (2019).
- [2] T. C. Ransom, R. Casalini, D. Fragiadakis, A. P. Holt, and C. M. Roland, preceding Comment, Comment on "Experimental Evidence for a State-Point-Dependent Density-Scaling Exponent of Liquid Dynamics", *Phys. Rev. Lett.* **123**, 189601 (2019).
- [3] R. P. Feynman, The 7 Percent Solution, in *Surely You're Joking, Mr. Feynman!—Adventures of a Curious Character* (W. W. Norton & Company, New York, 1985).