

Rufflé *et al.* Reply: It was recently established, using inelastic x-ray scattering (IXS), that in two network glasses (lithium diborate or LB2 [1], and densified silica or *d*-SiO₂ [2]) the linewidth Γ of longitudinal acoustic modes rapidly increases with frequency Ω , towards a Ioffe-Regel (IR) crossover at Ω_{IR} in the meV range. This crossover relates to the low temperature thermal conductivity plateau. A reasonable explanation for the observations is that acoustic modes hybridize with low frequency opticlike ones, reconstructing the density of states (DOS) [3]. The excess over Debye of the reduced DOS, $g(\omega)/\omega^2$, leads to various boson peaks (BPs) at Ω_{BP} in Raman scattering (RS), hyper-Raman scattering (HRS), IXS, and inelastic neutron scattering (INS). We found in [1] that $\Omega_{\text{IR}} \approx \Omega_{\text{BP}}$ for several network glasses, as well as for some intermediate ones, while the relation might not apply to fragile glasses where the excess DOS could be too small. This is challenged in [4].

A meaningful test of the relation requires reliable values for Ω_{IR} . To this effect we noted that $\Gamma = \Omega/\pi$ at Ω_{IR} . A straight line through Γ/Ω versus Ω in the region $\Gamma/\Omega \sim 1/\pi$ crosses the ordinate $1/\pi$ at $\approx \Omega_{\text{IR}}$. This provides an observational error bar on Ω_{IR} , which is essential owing to limitations of IXS. Details, including values for Se ($\hbar\Omega_{\text{IR}} = 2.4 \pm 0.5$ meV) and corrected ones for OTP, are found in [5]. It is misleading to present Ω_{IR} with fixed error bars as in [4]. This is evident for two new systems introduced in [4], as shown in the insets of Fig. 1. For CKN [6], no reasonable Ω_{IR} can be given at all, while for GeO₂ [7] the error bar on Ω_{IR} is so large that it makes no sense including it. A third system introduced in [4] is the binary alloy Ni₃₃Zr₆₇. It is shown separately [8] that the observed intercept $\Gamma = \Omega/\pi$ does not correspond to an IR crossover in this case. For these reasons the three new systems of [4] are not usable in Fig. 1.

Ω_{IR} should be compared to the maximum in the *reduced* DOS. This does not necessarily correspond to an *observed* Ω_{BP} . For example, in INS, there can be an “in-phase” component to the BP much below an “random-phase” one, as found, e.g., in a careful analysis of B₂O₃ [9]. The strong in-phase component, located well below the true excess DOS, results from umklapp processes. The neutron Ω_{BP} values on borates, LB2 and lithium-tetraborate LB4, quoted in [4], are thus suspect in absence of detailed analysis and publication. For symmetry-active BP modes, the coupling to light can be fairly constant in RS or HRS, providing fair values for the position of the reduced DOS peak, as, e.g., in [10]. For LB2 we use a combination of 10 meV in RS, 9 in HRS [11], and 8–8.5 in IXS, or 9 ± 1 meV. For LB4, we take 7.7 from RS and 6.5 from HRS [11], or 7 ± 1 meV, just as in [12]. For silica, umklapp scattering does not appreciably displace the BP in INS. We take $\hbar\Omega_{\text{BP}} = 4.9$ meV [13], a value corresponding to the high temperature of the IXS measurement. For *d*-SiO₂, we take 7.5 ± 1 from Fig. 3 of [2], which agrees with HRS [11].

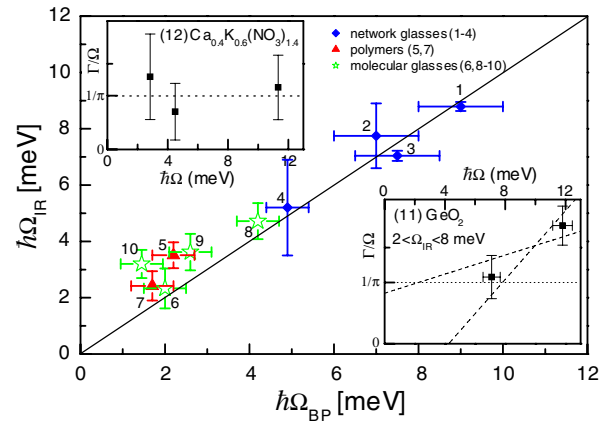


FIG. 1 (color online). Ω_{IR} vs Ω_{BP} according to the best literature data. The labels are identical to these in [1], 6 being propylene carbonate at $T_g + 7$ K. The insets are explained in the text.

Redrawing Fig. 3 of [1] with the best current information [14], we obtain Fig. 1. It strongly conveys the important message—which in a way also comes out from the rather rough estimates in Fig. 2 of [4]—that there definitely exists a correlation between Ω_{IR} and Ω_{BP} .

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