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Alan McGaughey  
Associate Professor  
Department of Mechanical Engineering  
Carnegie Mellon University  
Pittsburgh, PA 15213-3890  
Tel: (412) 268-9605  
Fax: (412) 268-3348  
Email: mcgaughey@cmu.edu

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Dear Victor Vakaryuk:

Thank your for organizing the review of our manuscript BH12397, “Thermal Conductivity Accumulation in Amorphous Materials.” We thank the referees for their helpful comments and were please that the Second Referee found the work to be “timely and extremely thorough.” We have responded to all referee comments in the attached rebuttal and in revisions to the manuscript that strengthen but do not change our conclusions.

In response to the First Referee’s main criticism, we believe that our manuscript is suitable for publication in *Physical Review B* for the following two key reasons: (i) It is a timely comparison with the work of Regner et al. [*Nat. Commun*. **4**, 1640 (2013)], who present the first-ever experimental measurements of thermal conductivity accumulation in amorphous silica and amorphous silicon. Specifically, our findings question their interpretation of the experimental data. (ii) It provides detailed insight into why amorphous silica and amorphous silicon, two materials that may seem similar at first glance, show very different thermal transport behavior. Specifically, we find that the absence of a propagating mode contribution to the thermal conductivity of amorphous silica (which is strong in amorphous silicon) is directly related to an earlier transition away from Debye-like behavior in the low-frequency mode properties.

We look forward to your response.

Sincerely,



Alan McGaughey

**Response to the Second Report of the Second Referee**

*1) Both referees made extensive recommendations to improve the quality of the research and presentation to make the paper suitable for publication in Physical Review B. The authors have chosen to essentially ignore most of those recommendations and make only very minor changes to the paper. In other words, the authors have not adequately addressed the concerns raised by the referees. Since I know it is the policy of Physical Review B to avoid multiple rounds of review, I recommend that the paper be rejected.*

We would like to provide some statistics concerning the original recommendations from the referees and our response to them. We feel these demonstrate, to some degree, that we did not “essentially ignore” the recommendations of the referees:

- Word count of referee reports: 882

- Word count of our responses: 2201

We responded in detail directly to the referee's recommendations.

- Number of referee comments: 6 + 11 = 17

- Number of referee comments which led to modifications of the manuscript:

4 + 9 = 13

We responded with modifications to the manuscript for 76% of the referees recommendations.

In all, the responses to the referee recommendations led to the following major modifications to the manuscript:

- 10 changes to the text in response to the referee recommendations, which were highlighted in red text. The number of words in the modified text is 592.

- The replacement of Fig 1.

- Modification of Fig. 5.

- The removal of 10 and addition of 3 references.

We believe we worked carefully to respond to the referee's recommendations. However, we also acknowledge that these simple statistics cannot determine whether our responses were adequate, as evidenced by the second report of Referee 2. It is difficult to attempt any further modification based on how limited the second report of Referee 2 is. We also believe it is worth quoting the First report of Referee 2:

*“The topic is timely and the work extremely thorough. I think this work is*

*publishable in PRB in a revised form after the authors have considered*

*the following comments.”*

Since we are unable to determine why Referee 2 has changed their opinion completely, we move on to the Second report of Referee 1.

**Response to First Referee**

*The authors have made reasonable effort in revising the manuscript*

*along the lines suggested by both reviewers. However, I feel that the*

*authors should do a little more before the paper is accepted for*

*publication.*

*[1] The number of citations is still too large and can be reduced*

*significantly. The authors are advised to use the minimum number of*

*citations (either the most recent or the most relevant).*

*For example page 1: there is no need to cite all references in line 2, line 3,line 4, line 5, line 6, and line 11;*

none of these lines have references, in 1 or 2 column format.

*page 2: there is no need for so many reference in line 6 below Eq (2);*

*is there any need for Ref 45 before Eq (4) and Ref 43 after Eq (4)?*

*There is no need for Eq (4) itself (as it is found in all*

*undergraduate text books).*

Eq. 2 is on page 4 in 1 column, page 2 in 2 column format. The references [4-8,15,18] all use some form of Eq. 2, which forms the basis for predicting the propagating contribution in our work. We fell these References are highly relevant to our work.  
  
Both Refs. 43 and 45 come after Eq. 3, before Eq. 4.  They are references to standard textbooks on solid state and phonon physics. Ref. 43 is used 4 times and Ref. 45 is used 5 times throughout the rest of the document.

*page 3: Eqs (5) and (6) can be fused into one equation. Is there any*

*need for expressing the expressions in Eqs (7) and (8).*

We have fused together Eqs. (5) and (6) in the revised manuscript. Eqs. (7) and (8) are necessary because we predict lifetimes and then fit Eq. (8). The lifetimes are then transformed to MFPs using Eq. (7).

*page 5: Eq (11) is again provides a standard expression and there is*

*no need for it in the manuscript (with a view to reducing the size of*

*the manuscript).*

While Eq. 11 is a standard expression, including it allows us to easily discuss and specify the width of the unit step function used to broaden the DOS. Removing Eq. 11 does not reduce the length of the manuscript significantly.

*page 6: Why so many reference in the line before eq (12)?*

These are all references to previous publications which use the structure factor to measure or predict effective dispersion in amorphous materials. We believe these References are important to clarify recently published works (Refs. 9, 79, 87-90) which predict the mode group velocities using questionable theoretical techniques. Each of these references is also used elsewhere in the manuscript.

*page 12: reduce the number of citations in line 10 in section V.A.*

There are no references on line 10 in either 1 or 2 column format.

*page 17: reduce the number of citations in the Summary section.*

No new references are introduced in the Summary section. We feel the references in the summary help to place our current results in proper context with previous work and our suggestions for future work.

*[2] In the previous review I advised the authors to change the phrase*

*'Umklapp scattering' with 'anharmonic scattering'. The defense by the*

*authors is unfortunate and indicates that they do not wish to be*

*corrected for their misconception. It is simply not good to copy*

*mistakes made by previous authors, especially when a reviewer points*

*it out.*

In the first revised manuscript, we used the phrase “Umklapp-like” scattering in an effort to correct the common use of “Umklapp”. Since the referee feels this is insufficient, we have modified the currently-revised manuscript to use “anharmonic” scattering.

*[3] Why is the temperature part not indicated in Eq (8)? Note that Eq*

*(4) does include temperature. The discussion following Eq (8)*

*regarding divergence for n>2 is misleading. The authors should*

*rephrase their statement. Also, they should only cite one reference*

*for supporting their statement (rather than Refs 5,7,8).*

Temperature is not indicated in Eq. (8) because we perform the NMD calculation at 300 K. The temperature dependence is incorporated naturally into the B coefficient.

We have modified the discussion following Eq. (8) to read:

“...Choosing n > 2 causes the thermal conductivity to diverge in the zero-frequency limit,...”

References 5,7,8 all use boundary scattering to prevent their predicted thermal conductivities from diverging using Rayleigh scattering. We are unaware of any rule which requires just one citation for supporting a statement. There are many instances in our manuscript where several citations are used to support a statement.