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February 21, 2015

*Journal of Visualized Experiments*

Dear Editor:

We received the editorial and reviewers’ comments on the manuscript JoVE52869 entitled “*Synthesis of Non-uniformly Pr-doped SrTiO3 Ceramics and Their Thermoelectric Properties*” by Arash Mehdizadeh Dehkordi, Sriparna Bhattacharya, Taghi Darroudi, Husam N. Alshareef and Terry M. Tritt. We would like to express our appreciation for your time and efforts spent on handling our manuscript. We have revised and improved the manuscript according to the comments. Detailed response to the comments and the changes made in the manuscript are included at the end of this letter.

If you have any further questions or if any of our coauthors or us, may provide any additional information, please do not hesitate to contact us. Thank you for considering this manuscript for publication in the *Journal of Visualized Experiments*.

Sincerely yours,

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The manuscript has been revised and improved according to the comments. The changes made in the revised manuscript are included under the Response and Change sections below and are highlighted in the manuscripts using “Track-Changes” function of Microsoft Word. We believe that the critique have greatly improved the quality and clarity of the manuscript. Our responses to these comments are as follows:

**Science Editor:**

**Comment #1:** Please take this opportunity to thoroughly proofread the manuscript to ensure that there are no spelling or grammar issues. The JoVE editor will not copy-edit your manuscript and any errors in the submitted revision may be present in the published version.

**Response:** The manuscript has been proofread.

**Comment #2:** Please add more details to your protocol steps. Please ensure you answer the “how” question, i.e., how is the step performed? Alternatively, add references to published material specifying how to perform the protocol action.

**Response:** Additional information along with the reference for detailed operation was added to the steps of the protocol to answer the “how” questions.

**Comment #3:** 1.12: Should the pellet be ground after this second calcination process before 1.13?

**Response and Change:** Thank you for pointing this out. This intermediate grinding was added as an extra step.

**Comment #4:** 2.10: Followed by what of the current?

**Response and Change:** This sentence was rephrased.

**Comment #5:** 3.3: How is the pellet cut? Also, please indicate in which steps each kind of cut piece is used. If the steps are not included in the protocol, please give citations for the analysis.

**Response and Change:** The pellet is cut using a diamond saw. This information was added to the description of this step (3.3).

**Comment #6:** 3.4.1: Please provide a reference on how to perform the DSC. Also, please add the experimental parameters: how much of the samples were used, how long, etc.

**Response and Change:** The reference of DSC and the details of the measurement parameters were added to the manuscript.

**Comment #7:** 3.6: Please provide a reference on how to operate the gold sputtering unit. How are the tiny holes cut?

**Response and Change:** The reference of DSC and the details of the measurement parameters were added to the manuscript.

**Comment #8:** Please revise the highlighting of the protocol text for filming. Only 2.75 pages of highlighted protocol text is permissible and there are currently 3.25 pages. Please include all relevant details that are required to perform the step in the highlighting. For example: If step 2.5 is highlighted for filming and the details of how to perform the step are given in steps 2.5.1 and 2.5.2, then the sub-steps where the details are provided must be highlighted. The Protocol is >3 pages highlighted. The authors could possibly unhighlight parts of section 3, which appear to be standard techniques without much stepwise detail (like 3.7).

**Response and Change:** The parts which are not of considered a critical step in the filming were unhighlighted according to editor’s comment.

**Comment #9:** JoVE cannot publish manuscripts containing commercial language. This includes trademark symbols (™), registered symbols (®), and company names before an instrument or reagent. Please remove all commercial language from your manuscript and use generic terms instead. All commercial products should be sufficiently referenced in the Table of Materials and Reagents. There is unnecessary branding in 1.6 and 2.4 (Carver) and in 3.2.1 (MicroFlash).

**Response and Change:** Commercial language including the names of the suppliers of the equipment was removed from the manuscript.

**Comment #10:** Overall, the discussion is more results than method oriented. The discussion needs to focus on the methods in terms of the 5 discussion requirements. Which steps are critical? Are there any modifications or troubleshooting that typically occurs? How are these methods superior to the alternatives? Please discuss the limitations and critical steps of the technique. What are some future applications of the technique? Simply stating “this work may open new horizons and opportunities to other properties and applications” is not very informative.

**Response and Change:** The important step(s) were highlighted throughout the protocol.The future opportunities of this synthesis method were clarified. The key differentiating the synthesis strategy described in this protocol from previous reports in the literature were highlighted in the discussion.

**Comment #11:** JoVE reference format requires that DOIs are included, when available, for all references listed in the article. This is helpful for readers to locate the included references and obtain more information. Please note that often DOIs are not listed with PubMed abstracts and as such, may not be properly included when citing directly from PubMed. In these cases, please manually include DOIs in reference information.

**Response and Change:** The DOIs of the references which were available were included in the reference list. We’d appreciate if the JoVE template can be modified to include the DOIs for future publications.

**Reviewer #1:**

**Comment #1:** Line 70 Reference is not defined.

**Response:** The reference to room-temperature electron mobility of SrTiO3 had already been cited. It seems that Microsoft Word cross-referencing had a problem in updating the reference number. This issue was resolved.

**Comment #2:** Line 92 Reference is not defined.

**Response and Change:** Reference 12 has been cited for “spark plasma sintering technique”.

**Comment #3:** Line 351 Reference is not defined.

**Response and Change:** Reference 13 has been cited for the results reported in Line 351.

**Comment #4:** Figures 2(b) and 2(c) are missing.

**Response:** Figures 2(b) and 2(c) have already been included in the Fig. 2.eps file uploaded before. It seems like the online pdf compilation system somehow did not incorporate the image.

**Comment #5:** Y-axis unit of Fig. 3(b) should be microV K-1 not mV K-1.

**Response and Change:** Fig. 3 (b) was modified. It seems that the “mu” font had been change during file conversion.

**Comment #6:** Line 352-353 The authors mention that … whole temperature range over all previously reported maximum values were achieved …. However, no reference is cited.

**Response:** We thank the review for his/her comment. However, since the reported values were higher than reported in “all” previous publications we believe that the citations of selected previous reports might be unnecessary. However, Fig. 3 compares the results to some of the highest values reported in the literature. The references are included in the caption.

**Reviewer #2:**

**Comment #1:** Line 114: Researchers generally use the powder of Pr2O3 for synthesis. So the authors should shortly explain why the Pr2O3 sintered lump was used in the manuscript.

**Response:** We thank the reviewer for his/her comment. However, to the best of our knowledge researchers use both forms of Pr2O3. Alfa Aesar only supplies Pr2O3 in “sintered-lump” form which was chosen due to its competitive price comparing to the Pr2O3 supplied by Sigma-Aldrich. Nevertheless, our recent publication (Dehkordi *et al.*, J. Appl. Phys. **117** (2015) 055102) shows that the thermoelectric properties following the synthesis protocol presented in the manuscript is independent of the choice of Pr doping source.

**Reviewer #3:**

**Comment #1:** Line 70: Give references to the low carrier mobility of single crystals.

**Response and Change:** The reference to room-temperature electron mobility of SrTiO3 had already been cited. It seems that Microsoft Word cross-referencing had a problem in updating the reference number. This issue was resolved.

**Comment #2:** Line 33-34: Power factor is already a defined term in thermoelectrics. The authors should change the phrase. "We herein define the numerator as the power

factor..."

**Response:** Traditionally, the thermoelectric power factor is defined in the Z context (not ZT) as σα2 where σ is the electrical conductivity, and α the Seebeck coefficient. Researchers still generally define the power factor this way. However, here we define the power factor as σα2T. Not only this definition portrays the actual temperature dependence of the electronic properties incorporated in ZT calculation but it also gives the SI SI of W/m-K similar to that of thermal conductivity.

**Comment #3:** Line 92: provide references to the conventional sintering.

**Response and Change:** Reference to “conventional sintering” had already been cited. It seems that the Microsoft Word cross-referencing had a problem in updating the reference number. This issue was resolved.

**Comment #4:** Line 118 and 120: "Weighted" powder should be "weighed" powder.

**Response and Change:** Thank you for pointing this out. The typo was fixed.

**Comment #5:** Line 123-124: 1.4) the step is not clearly understood. How does mixing of TiO2 powder cause reduction of volume? Do the mixing process involve manual mixing or using any particular mixing instrument?

**Response:** The mixing can be done either manually or with a commercial tabulator/mixer. Since the TiO2 is a nanopowder mixing help locally cold-pressing the powder to reduce the overall volume of the portion used so it can be fitted in the stainless steel die. This part was removed to avoid confusing the reader.

**Comment #6:** Line 131: "green body" is an unscientific language. Replace it with a more appropriate noun.

**Response:** “Green body” is the technical term used primarily by ceramist for unsintered or unfired ceramics, which has been used extensively in the journal publications as well as the encyclopedia of advanced materials.

**Comment #7:** Line 138-141: 1.9) Define calcination first and then use the term. the phrase "let it reside.." is inappropriate in scientific papers. Replace it with clear words like "kept it at the elevated temperature.."

**Response and Change:** Calcination is a known technical term used by researchers in ceramics sciences and processing referring to the thermal treatment (firing) step in the solid-state reaction synthesis of ceramics. We do not believe this term needs to be defined here. The text was modified according to the reviewer’s comment on “let it reside…”.

**Comment #8:** Line 144: Has turbulator been used before during mixing the powders? If yes, mention.

**Response and Change:** Yes. The use of turbulator/mixer was added to step 1.4.

**Comment #9:** Line 267-271: The step describing the use of scotch-tape is not clear. The author should elaborate on this point for clear understanding to the general readers.

**Response and Change:** This step was clarified to explain the use of scotch tape as a stencil for the gold sputtering of the contacts.