**Dear Editor-in-Chief,**

Thank you and the respected reviewers for reviewing the article entitled "*Cyclic Hardening/Softening Behaviors in Nano-Clay-Composite and Aluminum Alloy under High-Temperature Strain-Controlled Loading*". The authors have tried their best to address all the reviewer's comments in the revised form. It is notable that changes were highlighted with yellow-colored sentences. Then also, all comments were answered one by one, which could be seen in the following paragraphs.

Best regards

**M. Azadi; PhD.**

**Reviewer: 1**

The background for this work is not clear stated in the introduction part that why the composited is used and what's the advantage/disadvantage compared with Al-Si cast alloys. Besides, there is no explanation on the general evolution of LCF with temperature and strain amplitude, which must relate to the evolution of precipitates. Meanwhile, no explanation on the differences of LCF between two different materials, which should relate the enforcement particles. Therefore, I would like to reject it from the view of point of materials science.

**Answer:** First of all, we should thank the respected reviewer to nice comments. We have tried our best to address all comments in the revised article. By such modifications, the authors wish to change the reviewer’s opinion which was against the publication. Based on this statement, the descriptions for the modifications could be listed as follows,

1. The literature review is improved to mention the application of the material and the background of this field of study, in the introduction.

In these parts, aluminum-silicon alloys have been widely used, due to their proper mechanical and fatigue properties, as advantages of the material. Therefore, to design such engine components, knowing the cyclic behaviors of such materials is essential for engineers. However, aluminum alloys have low strength at high temperatures as a disadvantage that should be improved. There are various approaches for such an objective, which one reinforcing method is the addition of nano-particles.

1. The respected reviewer is correct for describing precipitates in the microstructure of the material under strains and temperatures. Moreover, again the respected reviewer is exactly correct on the differences in LCF lifetimes between two different materials. By presenting such a description, the reinforcing role of nano-particles could be found. In other words, material science should be considered for a better discussion. However, since this manuscript is only presented for experimental fatigue data, no descriptions could be found on the material microstructure. This job was fully-done and it will be presented in a research article, besides this data-in-brief article. In order to address the respected reviewer’s comment, we have added the following text in the manuscript, at the end part of the conclusions part,

For further investigations, describing precipitates in the material microstructure will be studied under various strains and temperatures of fatigue testing. Moreover, material science should be generally considered for describing the differences in LCF lifetimes between two different materials. By presenting such a description, the reinforcing role of nano-particles could be found in the base material. This job will be presented by authors in the other researches, besides this data-in-brief article.

1. A discussion part is added to the revised article, as follows. However, since this article is a data-in-brief article; therefore, such parts were removed from the manuscript. However, all jobs were done and will be appeared in the next article. This was not presented before due to the limitation of the data-in-brief article and it may be a concern from the publication.

**Discussion**

As seen, the stress increase during cycles occurred at room temperature, known as the cyclic hardening behavior for both AlSi\_N\_HT6 and AlSi. Moreover, the AlSi sample exhibited the cyclic hardening trend at 200 ℃. However, at this temperature, cyclic softening was seen in AlSi\_N\_HT6. As reported in the literature (Fan et al., 2015), the cyclic hardening amount was lower at lower values of the strain amplitudes. For AlSi\_N\_HT6, this cyclic hardening was due to the effect of the stress transfer between the soft matrix and brittle particles (Luk et al., 2015). When the temperature changed to 250 ℃ and 300 ℃, the stress decreased during cycles. In other words, at high temperatures, the cyclic softening trend was seen for both AlSi\_N\_HT6 and AlSi. For the base material, agreed results by Guo et al. (2017) were represented. The cyclic softening behavior in the material was affected by the temperature and also the strain amplitude (Liu et al., 2013).

As another comparison, AlSi\_N\_HT6 had higher plastic strains than that of the AlSi sample, which is due to the heat-treating process (Azadi and Shirazabad, 2013). As another reason, the plasticity of the base metal was increased by the reinforcing phase. As reported in Luk et al. (2015), the reason for the AlSi\_N\_HT6 cyclic hardening trend could be the stress transfer, which would be occurred between the soft aluminum matrix and brittle nano-particles.

**Reviewer 2:**

This experimental study offers very useful results for the characterization of the cyclic behavior of the subject matter alloys. It can enrich the published literature in this area.

**Answer:** First of all, we should thank the respected reviewer to nice comments. We have tried our best to address all comments in the revised article. Then, authors should also thank the respected reviewer to understand the role of the valuable experimental data, which are presented in this manuscript.

The research has been conducted correctly but English requires drastic improvement, specifically in relation to syntax, grammar and accurate use of language in many instances - i.e. ‘enhancement of temperature’ should be ‘increase of temperature’, ‘effect of temperature was higher…’, ‘Researches about cyclic behaviors’ should be ‘research studies on …’, etc. The poor use of English affects greatly the readability of this paper.

**Answer:** Sorry for the mistakes. The whole manuscript has been fully-checked and the sentences have been corrected grammatically. English writing was also improved based on the Grammarly software with an overall score of 96 based on the American English. Moreover, all mentioned modifications by the respected reviewer have been addressed in the revised article.

Also, the authors are requested to clarify/amend the following issues:

- The methodology section should be expanded to include further details on the test configuration, material, etc. It is currently very briefly, lacking important information.

**Answer:** The methodology has been expanded and more details about the test conditions and specimen productions were discussed. Therefore, the method part is completely rewritten to address the respected reviewer’s comment, as follows,

The chemical composition of the piston aluminum-silicon alloy, which is used in this research, was included 13% wt. Si, 1% wt. Cu, and 1% wt. Mg. Aluminum bars were melted at 700 ℃ and then, the nano-composite was fabricated by adding 1% wt. of pre-heated (at 400 ℃) nano-clay-particles (montmorillonite K 10) into the aluminum matrix. This job was done 2 gr by 2 gr (to avoid the gas accumulation in the melt), with the stir-casting process. All casted cylinders were left in the free air at 23 ℃, to be quenched.

The LCF standard specimens were machined and then, a T6 heat treatment, including 1 hr solutioning at 500 ℃, water quenching, and 2 hrs ageing at 300 ℃, was done on the material. More details of the sample production process could be found in Azadi et al. (2020).

LCF testing was done under strain-controlled loading conditions, with the 10 kN servo-hydraulic Instron device. The mechanical strain amplitude was 0.20%, 0.25%, 0.30%, 0.35%, 0.40%, and 0.45%. The temperature was 25 ℃, 200 ℃, 250 ℃, and 300 ℃. It should be noted that the strain amplitude and temperature were constant during the tests. The strain rate was 1%/s and the strain ratio was -1, based on the E606 ASTM standard. The specimens were heated up using a 10-kW medium frequency generator for high-temperature During LCF testing, the temperature was measured using 3 K-type thermocouples. The strain was also measured by Instron room-temperature and MTS high-temperature extensometers for LCF tests at room and elevated temperatures, respectively. In addition to the fatigue test, the uniaxial tensile tests were performed to investigate the material properties of the samples at different temperatures using the 100 kN servo-hydraulic Instron device, based on the E8M ASTM standard. More details of testing could be found in Azadi et al. (2020).

- Figure 3 and 4 should be broken down to separate figures, showing clearly the different features and avoid using the strain level ‘boxed’ indicators.

**Answer:** Figures 3, 4, and 5 have been broken down and separated for clear observations. The boxed marks were also removed in the revised article.

- Figure 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17: Using circles for the data points makes visualization difficult. Please use dots or dashes instead.

**Answer:** Figures 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17 have been redrawn and dashes were used for better observations.

- Table 3 results: Can the authors please comment (add further details in the paper) on the increasing Average Error% with the increase of temperature? For example, is there an influence of the Ramberg-Osgood parameters’ choice?

**Answer:** That was a nice exact comment from the respected reviewer. Thank you. To address this comment, the authors have added the following sentences to the text, as follows,

As it can be seen in this table, by increasing the temperature, the average error and the maximum error gradually increased. One possible reason could be based on higher variations of fatigue testing data for standard samples, due to the microstructural changes under higher temperatures. However, the main concern for such changes in the relative error could be mentioned due to the scatter-band of experimental fatigue data.

- Table 4 and 5: Is four decimal points’ accuracy necessary? If yes please justify, if not please reduce to two decimals.

**Answer:** The point mentioned by the respected reviewer is correct. However, since in some cases, the values of the rate of cyclic hardening/softening of AlSi and AlSi\_N\_HT6 are too small, (i.e., $R\_{H/S}$ for AlSi\_N\_HT6 at 200 ℃ under the total strain amplitude of 0.25% is -0.0002), four decimal points’ accuracy seems to be necessary. For such an observation, they have been highlighted in the table.

- The results are very lightly discussed in many instances, despite the extensive array of data presented in the paper. The authors should expand the discussion throughout. That includes expanding the discussion on limitations.

**Answer:** The respected reviewer is correct. However, since the objective of this manuscript is to present a data-in-brief article, the discussion will be appeared in the next investigation, as a research article. This is also mentioned at the end part of the conclusions part to address the respected reviewer’s comment.

For further investigations, describing precipitates in the material microstructure will be studied under various strains and temperatures of fatigue testing. Moreover, material science should be generally considered for describing the differences in LCF lifetimes between two different materials. By presenting such a description, the reinforcing role of nano-particles could be found in the base material. This job will be presented by authors in the other researches, besides this data-in-brief article.

In addition, a section is added to the revised article for a limited discussion on obtained experimental data, as follows. This was not presented before due to the limitation of the data-in-brief article and it may be a concern from the publication.

**Discussion**

As seen, the stress increase during cycles occurred at the room temperature, known as the cyclic hardening behavior for both AlSi\_N\_HT6 and AlSi. Moreover, the AlSi sample exhibited the cyclic hardening trend at 200 ℃. However, at this temperature, cyclic softening was seen in AlSi\_N\_HT6. As reported in the literature (Fan et al., 2015), the cyclic hardening amount was lower at lower values of the strain amplitudes. For AlSi\_N\_HT6, this cyclic hardening was due to the effect of the stress transfer between the soft matrix and brittle particles (Luk et al., 2015). When the temperature changed to 250 ℃ and 300 ℃, the stress decreased during cycles. In other words, at high temperatures, the cyclic softening trend was seen for both AlSi\_N\_HT6 and AlSi. For the base material, agreed results by Guo et al. (2017) were represented. The cyclic softening behavior in the material was affected by the temperature and also the strain amplitude (Liu et al., 2013).

As another comparison, AlSi\_N\_HT6 had higher plastic strains than that of the AlSi sample, which is due to the heat-treating process (Azadi and Shirazabad, 2013). As another reason, the plasticity of the base metal was increased by the reinforcing phase. As reported in Luk et al. (2015), the reason for the AlSi\_N\_HT6 cyclic hardening trend could be the stress transfer, which would be occurred between the soft aluminum matrix and brittle nano-particles.

- Many of the bullet points in the Conclusions section are unclear - i.e. ‘Under the same strain amplitude, the amount of cyclic hardening decreased by temperature increasing.’ which is the same strain amplitude in this case?). The authors are requested to rewrite this section.

**Answer:** To address the respected reviewer’s comment, all the bullet points in the conclusions section have been checked and rewritten.

**Reviewer 3:**

- Literature survey is not included.

**Answer:** First of all, we should thank the respected reviewer for reviewing this manuscript. We have tried our best to address the comment in the revised article. Therefore, the literature review is expanded in the introduction, as follows. However, it was done before, and only it was not presented due to the limitation of the data-in-brief article and it may be a concern from the publication.

Branco et al. (2019) studied the strain ratio influence on the cyclic deformation behavior of the 7050-T6 aluminum alloy. Their results illustrated that the material depicted cyclic strain-softening, which increased when the strain ratio increased and the strain amplitude decreased. Cai et al. (2018) presented the temperature-dependent cyclic behaviors and the material microstructure of the AlSi10Mg(Cu) aluminum alloy. They claimed that Mg-Si precipitates were the reason for cyclic hardening in the as-received alloy, due to the pinning effect. Li et al. (2018) investigated the influence of isothermal and non-isothermal ageing on the LCF behavior of the forged Al-Cu-Mg-Si aluminum alloy. They demonstrated that the material exhibited cyclic stability, compared to cyclic hardening of the heat-treated samples.

Moreover, the article title is changed to “*Cyclic Hardening/Softening Experimental Data in Nano-Clay-Composite and Aluminum Alloy under High-Temperature Strain-Controlled Loading*” for a better understanding of the type of the manuscript. In addition, the first keyword is changed to “Cyclic experimental data”.