Ms. Ref. No.: metals-1908015

Title: Ion irradiation defects and hardening in FeCrAl alloy

Dear editor and referees,

We are grateful for your comments and suggestions to help our manuscript's revision. All of the comments have been carefully considered and our replies are appended below. Please note that reviewer comments are shown in blue font and our responses in **black** font. In our revised manuscript, we have added necessary discussions according to reviewers' suggestions, and all the changes are marked in red font.

Sincerely yours,

Yunxiang Long，Liping Guo,

School of Physics and Technology, Wuhan University, 430072 Wuhan, China

Responses to comments by Referee

Reviewers' comments:

The topic of the article is very interesting and in line with the goals and scope of the journal. However, I suggest a revision of the article in light of the comments that follow.

Reviewer #3:

1. Although the objectives are well defined at the end of the introduction, the research questions that the results of this paper are intended to answer are not stated. The authors need to clearly state how the contribution of this work differs from work that has already been done in this area. The introduction should be strengthened with some hypotheses, main conclusions, and scientific contributions related to other studies in the field.

Response: Dear reviewer, we have revised the introduction according to your suggestions.

2. Starting from line 78, the following error "Error! Reference source not found" is displayed. Check the reference to figures and tables. The figures and tables in the manuscript are not mentioned in the text.

Response: We are so sorry that the problems displayed have brought you a bad reading experience. It may be an error when the uploaded version is converted into the reviewed version. We will modify it on the latest version.

3. Line 94 mentions a damage whose development is shown in Figure 1. Define the nature of this damage and its effects and consequences.

Response: This damage is displacement damage, the meaning of which is displacements per atom (dpa). The high-energy neutrons bombard the material, causing the lattice atoms to be dislocated, resulting in the generation of interstitial atoms and vacancies. These interstitial atoms and vacancies can evolve to dislocation loops, cavities, bubbles, second phase precipitates and other defects, which will further lead

to a series of radiation effects such as radiation swelling, hardening and embrittlement, creep and component segregation. Finally, the degradation of the radiation resistance and mechanical properties of the material will be aggravated.

4. Figures 2 and 3 should be enlarged and the respective resolution increased. The magnification scale used must also be indicated in each figure.

Response: The TEM images with higher magnification have been added to the latest version (fig. 3 and 4), and the scales have also been indicated in each figure.

5. Sub-figures must be added to Figures 4 and 5, and the information associated with these sub-figures must be included in the respective caption.

Response: Sub-figures have been added to Figures 4 and 5, and the information is also included in the respective caption.

6. Each sub-figure of Figure 6 must be described in the figure caption.

Response: We have revised in Figure 6 caption.

7. Conclusions should be updated with current work limitations and future improvements.

Response: We have added the limitations of the current work, and proposed research schemes that can be further improved in the “Conclusions”.

Thanks again for your suggestions and comments.