

Review of: "The Influence of Hot Extrusion on The Mechanical and Wear Properties of an Al6063 Metal Matrix Composite Reinforced With Silicon Carbide Particulates"

Marie Reine Manlay¹

¹ CEA Grenoble

Potential competing interests: No potential competing interests to declare.

The objective of this manuscript is to present some results regarding the mechanical and wear properties of an aluminum-based composite. More particularly, this paper compares the effect of hot extrusion post-processing on the mechanical properties of an Al 6063-based composite reinforced with different weight fractions of SiC produced by stir casting.

However, the paper is poorly written, lacking methodology and reasoning, and some points are unclear. It is very factual, with no reasoning behind the results presented. All results require further analysis and reasoning. There are also numerous writing errors, such as the subjects of sentences, which lead to misunderstandings. Therefore, it is not suitable for publication and is rejected at this stage.

The following comments must be taken into account for a revised version of the paper to be considered for publication.

Generally, the figures are of poor quality, whether images or graphics. The authors should revise the figures to make them clear and self-supporting. In addition, there are too many images for too little text, and many images are unnecessary, such as those of samples. If the authors want to keep these images, they should caption them so that the reader understands what he is looking at. The legends of images and graphics are sometimes not appropriate. They must be modified to match the figures.

In the introduction section, it is necessary to provide more data from the literature on the mechanical properties of this type of composite. In addition, data on the mechanisms of reinforcement of aluminum alloys by ceramic particles could help to exploit the results presented.

In the experimental section, a reminder of the alloy composition might be desirable in order to see which alloying elements are present and what role they might have in improving mechanical properties.

The authors should also specify the size and morphology of the SiC powder in the experimental section, as well as the dimensions of the material before and after extrusion.

The experimental section also lacks details of the techniques used and their conditions of use. Which technique is used to measure sample density? With what uncertainty?

Details of mechanical test conditions are also missing. SEM analysis should also be introduced at this stage. Please note

that there is only one sub-section in the experimental section (there is a section 2.1, but no 2.2 or 2.3 etc.).

In the results section, all the characterization results presented lack further analysis to explain the results obtained, and the improvements observed, e.g., what explains the difference in mechanical properties before and after hot extrusion. All results require further analysis and reasoning from the authors.

The authors are asked to use only units from the International System (especially for density).

Density changes could also be linked to phase changes in the microstructure. DRX analysis may be appropriate to detect possible phase changes.

The authors would need to take the analysis further to justify the changes in density. In fact, the increase in density when more SiC is added is also simply reflected by the fact that the density of SiC is higher than that of aluminum.

There is a misunderstanding in the last paragraph of section 3.1 with the notion of ceramic particle sizes. Are different sizes used here? Also misunderstood is the fact that as the volume fraction of reinforcement increases, porosity increases, while density increases. Review the justification for better clarity, with further analysis.

Scale bars are missing from the SEM images, which are also unclear.

In the conclusion, the authors point to grain refinement in the extruded material. Where does this result come from? A clear picture of the microstructure before and after post-processing would be interesting.

In addition, mechanical properties are certainly closely linked with the solidification microstructure, so a microstructural study could provide clues to the interpretation of the mechanical characterizations presented.

In addition to all these remarks, it is surprising that the authors did not address the problem of the decomposition of SiC into aluminum carbide that occurs when SiC comes into contact with liquid aluminum. SiC can, in fact, be decomposed into Al_4C_3 , a water-soluble carbide that is detrimental to the composite parts' lifetime.