In this manuscript, the authors tried to demonstrate that suspension plasma spraying (SPS) is a promising process to manufacture good wear resistant carbide coatings. They deposited carbide coatings by using the suspension plasma spraying technology under the same spraying parameters with TiC and Cr3C2 aqueous suspensions, respectively. The resulting coatings were characterized in terms of surface morphology, microstructure, phase constitution and micro-hardness. The abrasive, erosive and sliding wear performance of the SPS processed TiC and Cr3C2 coatings was examined and compared with air plasma sprayed T-400 (Tribaloy) coatings.

The authors emphasized that the novelty of this work relates to processing fine sized carbides in the form of suspensions for the first time to fabricate wear resistant coatings. However, this is not the case. Many research jobs carried out on wear resistant coatings by suspension Plasma Spraying in the past two decades. For instance, the nanostructured WC-Co cermet Coatings by suspension Plasma Spraying, etc.

Yes, the primary focus of our study was on exploiting the SPS route to deposit TiC and Cr3C2 coatings. However, we had obviously used inappropriate wording and missed citing some relevant literature. This has now been corrected and we are grateful to the Reviewer for pointing this out.

Titanium and chromium-based carbides are attractive coatings to impart wear resistance. However, plasma spraying of carbide material is a challenging task since the carbides tend to decompose at high temperatures, as shown in XRD results of this work. The loss of carbon is thought to occur because of direct oxidation on the surface of solid carbide, leading to formation of other phases.

How to maintain low carbon loss becomes a key issue. Suspension plasma spraying permits projection of liquid feedstocks directly. The interaction between plasma and liquid atomizes the suspension into a fine mist and evaporates the suspension medium, thereby concentrating the solid content into fine particles. Despite the high plasma temperature, the decomposition of the carbide material should in principle be reduced by the evaporating liquid carrier, which imposes a substantial thermal load on the plasma. Upon impact on the substrate, these particles form thinner lamellae than in conventional spraying. Thin coatings with more refined microstructures and potentially smoother surface finishes are created. If the authors could add some work in the aspects mentioned above, it would be innovative.

Authors completely agree with the excellent points made by the Reviewer. Although all of the above were a motivation when we initiated this challenging study to deposit TiC and Cr3C2 coatings by the SPS route, we had missed articulating some of the above stated benefits of SPS. Some of the previously missing points have now been added in the modified text. A discussion on the refined microstructure and smoother surface finish in the SPS carbide coatings is also included.

More details as shown below

In the manuscript, the abrasive, erosive and sliding wear performance of the SPS processed TiC and Cr3C2 coatings was examined and compared with air plasma sprayed T-400 (Tribaloy) coatings. Since the carbide coatings and T-400 coatings are different in terms of chemical composition and mechanical properties, and deposited by different methods, a comparison sounds not so convincible.

Since there was no opportunity to atmospheric plasma spray the two carbides conventionally using spray grade powders, we compared the tribological performance of the coatings with APS T-400 merely because the latter is a known wear resistant coating. However, we have now omitted it based on the above comment.
In the abstract, page 1, It is acceptable if the abbreviation is common in the field, there is no risk of confusion. since SPS is explained in the context, it is better to explain APS as well.

T-400 processed by APS has now been excluded from the manuscript based on the Reviewer’s recommendation and the abstract modified accordingly.

In the experimental work, the APS parameters are not presented.

Same as above... T-400 processed by APS has now been excluded from the manuscript based on the Reviewer’s recommendation.

If the plasma operating conditions like current, voltage, primary gas, etc, are listed in table 1, it would be better.

Key operating parameters are now added to Table I, as recommended.

More details are required for XRD measurement in the experimental work.

More details regarding XRD are now added to the revised manuscript.

More details for surface roughness in the experimental work. How many measurements were taken? The result of surface roughness of the as-sprayed carbide coating was not given and discussed in the result and discussion section. (it was only used to measure surface roughness for specimens in the wear test?)

Surface roughness measurement details are now included in the experimental section. Furthermore, we have added the surface roughness of as-sprayed coatings and discussed in the results section.

In the experimental work, microhardness test needs more details, like load, dwell time, etc. How many measurements?

The above details have now been included in the Experimental section according to the Reviewer’s suggestion.

How many samples for each group in the wear tests (erosion, sliding and abrasion), in the experimental work?

The above details have now been included in the Experimental section, according to the Reviewer’s suggestion.

In figure 4, Page 4, it looks there exist many un-melted particles in the TiC coating.

There are indeed several unmolten particles in TiC, although the coatings exhibit good wear behaviour and this has been discussed in the results.

Why not to use the same magnification for size comparison in figure 4.

The magnifications were identical. We apologize for the confusion.

The porosity can be measured by image analysis. This will be more reliable to compare the two carbide coatings.

Porosity measurement is now included in the manuscript, as recommended by the reviewer.

Need to label the unmelted particles and the splat boundaries in figure 5 and 6.

Figure 5 & 6 are now appropriately labelled – we appreciate the useful suggestion.
In lines 112-114, page 4, why it is suggestive of reasonably good inter-splat cohesion? Because the splat boundaries could be discerned?

The cross sectional SEM micrographs did not show any delamination cracks or separation at the splat boundaries, indicating good inter-splat cohesion.

In line 134, you cannot guess the relative amounts of phases based upon the relative intensities of the diffraction peaks. Sometimes one pattern is more intense because it diffracts X-rays more efficiently.

We realize that the discussion was inappropriately phrased...we have modified it now.

In figure 7, page 6, an amorphous material may be presented in the mixture. Has the background noise been removed?

The background noise was removed. It is indeed suspected that there could have been some amorphous phase content in the sprayed coating.

In line 142-143, page 6, it is not meaningful to compare different materials processed by different methods.

The comparison is now excluded as per the Reviewer’s suggestion.

In figure 8, page 7, the error bars are not given in figure 8b and 8c. Could the error evaluation be performed? Is the experiment repeatable?

The error bars for erosion study are included. However, the abrasion and sliding wear test was performed on one specimen.

APS T-400 is not a good reference to compare the wear behaviour for SPS carbide coatings.

The comparison is excluded as per the Reviewer’s suggestion.

In lines 152-154, it is hard to conclude that the microstructure comprising fine structured splats (SPS) favours improved performance under all wear modes compared to the microstructure with relatively larger splats (APS), since the comparison is not reliable.

The comparison is excluded as per the Reviewer’s suggestion.

In the conclusion, the authors did not well summarize the content.

The conclusion section has been modified now.

The authors thank the reviewer for the constructive comments and helping to improve the quality of the manuscript.