Point –by- point response to reviewers

Sustainable utilization of the vegetable oil manufacturing waste product in the formulation of eco-friendly emulsifiable cutting fluids

Submission ID 88ff5a15-bca2-4a63-82fe-bdff8c0d413f

Dear Professor:

Editor-in-Chief of Scientific Reports

Thank you for your kind coordination. And, thanks the reviewers for constructive suggestions. Here, we submit a new version of our manuscript, which has been modified according to the suggestions of reviewers. The corresponding changes have been highlighted in yellow in the main text. The detailed corrections are listed below point by point.

Please let me know if you have any further suggestions. We are looking forward to hearing back from you.

Regarding to the comments of reviewer #1:

1. What is MCF in Abstract? When an abbreviation is written firstly, the full words should be given out, and otherwise readers will confuse on it.
   
   Reply: Thank you for pointing this out, full words added.

2. There should be a blank between a word and its followed bracket, such as oil (~20-40%) in Introduction, which should be corrected thoroughly throughout this manuscript.
   
   Reply: Done as recommended.

3. Abstract should be rewritten. What are the challenges and difficulties met in this field? What are the digital results obtained in this work? Significant digital results should be highlighted in Abstract. These items should be answered in Abstract.
   
   Reply: All of these recommended comments were addressed thoroughly and highlighted as recommended.
In this work, eco-friendly and fluid are presented, while recent significant progresses on manufacturing are lost. In this regard, follows should be added in Introduction. Toxic and corrosive fluids and slurries are widely employed in cutting and polishing, resulting in the pollution to the environment. To overcome this challenge, novel green fluids were developed for copper (Applied Surface Science, 467-468 (2019) 5-11), sapphire (Nanoscale, 2020, 12 (2020) 22518-22526), alloy (Applied Surface Science, 506 (2020) 144670), diamond (Applied Surface Science, 564 (2021) 150431), silicon (Nanoscale, 15 (2023) 9304-9314) and fused silica (Applied Surface Science, 637 (2023) 157978). Using the green fluids, high-performance surfaces are obtained, for the use in semiconductor, optoelectronics and aerospace industries (Applied Surface Science, 427 (2018) 409-415). These studies are a great contribution to the conventional manufacturing, and the most important is reducing the pollution to the environment effectively (Journal of Manufacturing Processes, 62 (2021) 762-771).

Reply: Done as recommended.

5. The introduction is not properly prepared. For example, the effect of generated heat cannot be “removed,” but instead, the heat will be carried away by the lubricant during the cutting process. The cooling process is crucial for metal cutting, while it is not explained in the manuscript.

Reply: Hence, the effect of the generated heat on the cutting tool will be removed replaced by Hence; the heat will be carried away by the lubricant during the cutting process. The cooling process was explained in the manuscript as recommended.

6. MCF and MWF are confused in text, which should be unified on them.

Reply: MCF was unified in the manuscript as recommended.

7. The first two sentences in Conclusion section are not appropriate. They are background information and should be removed.

Reply: Done as recommended.
8. The authors should double-check the entire manuscript for typos like double spaces and misspellings.

   Reply: Manuscript as all (typos like double spaces and misspellings) were revised and corrected thoroughly as recommended.

9. The mechanism behind the lower friction achieved by FVI was not fully investigated and explained. How does the content in different oils influence friction behavior? This should be interpreted well in text. Moreover, cutting speed is normally from 1 to 100 m/s. Therefore, the test results in Fig. (17) is not very helpful in determining the tribological advantages of the invented formula.

   Reply: The mechanism behind the lower friction achieved by FVI was interpreted deeply as recommended. Unfortunately, Physica MCR 502 is our only available option, having a sliding speed range from 10^{-8} to 1.4 m/s. Furthermore, earlier studies used the same speed range for tribological testing such as:


10. In the final section, six formulas were tested by the first few tests, and however only I and VI were tested in the final few tests. Why were other formulas not tested?

    Reply: All stable soluble oil emulsions (FI-FVI) underwent a corrosion test. Many rust spots and stains that appeared on the filter papers led to the exclusion of formulas (FII- FV). While Formulas I and VI displayed no rust on the filter papers. Therefore, Formulas I and VI showed good protective effectiveness. So, Formulas I and VI were chosen for additional testing.

11. More importantly, an overall performance evaluation should be given out after all tests. A new subsection should be added to fully compare and elucidate all samples. Moreover, the Conclusion should be rewritten to show which formula is the best and what the reason is.
Reply: As per recommendation, this part was illustrated more accurately in each given section and was also referred to in the Conclusion section of the research as recommended.

Regarding to the comments of reviewer #2:

1. In Introduction, these sentences “there is another problem in the industry, during the machining process;……… and cutting tool-chip interfaces”, are introduced too suddenly. The logical relationship between the upper and lower sentences is not tight which should be corrected thoroughly throughout this Introduction.

   Reply: The sentences are corrected thoroughly throughout this Introduction as recommended.

2. Moreover, in previous reports, the problems existing in the cutting fluids and the effect indicators are not clearly indicated in Introduction. In addition, eco-friendly and fluids are presented in Introduction, while recent significant progresses on them are ignored. Consequently, follows should be addressed in Introduction. Toxic and corrosive slurries and fluids are employed in cutting and polishing fluids. This induces pollution to the environment. To solve this challenge, novel green fluids are proposed. Using the novel green fluids, high-performance surfaces are manufactured, and the pollution to the environment is greatly reduced. These works are published in Journal of Manufacturing Processes, Applied Surface Science and Nanoscale, etc.

   Reply: Done as recommended.

3. Figures 3-9 simply illustrate the chemical structure, and however analysis methods, detailed introduction and references are not mentioned and discussed. It is necessary to add them.

   Reply: Detailed introduction and references about synthesis of all compounds are mentioned in the manuscript.

4. It is hard to read/identify any dates in Fig. 14. Putting all these uniform size pictures together without highlighting is a bad idea. So does for Fig. 15.
Reply: Figures 14 and 15 are modified as recommended.

5. Stable properties of the emulsions are measured through laser confocal scanning microscope. It should refer to Li Yunxing from Jiangnan University published in Chemical Communications, title “Ultra-stable Pickering emulsion stabilized by a natural particle bilayer”.

Reply: The authors hoped to have this device (laser confocal scanning microscope) in our laboratory, but unfortunately, it was unavailable and the analysis was performed on the optical polarizing microscope and added in page 20.

6. Font size in graphics should be uniform, and formulas (1)-(2) should be uniformed for the insets.

Reply: Done as recommended.

7. In Results and Discussion, “3.6.1.1. Preparation of metal cutting oil package” is put in the wrong position, and some experimental description should appear in the experiment.

Reply: Done as recommended.

8. It is necessary to add more test data on the pollution-free of the cutting fluids.

Reply: Cytotoxicity assay was performed and added in the page 21.

9. The Conclusion part should be rewritten by summarizing the contribution of this article point by point.

Reply: The Conclusion part was rewritten by summarizing the contribution of this article point by point.