Polymers for Extreme Temperature Applications

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1 Abstract

I will write the abstract as the last part of my paper, as it should survey the topics and results discussed. Citation examples for LaTeX, which I will be using to write and format this paper, compilation. I am using ACS as a reference style. Also, I have appropriately removed the outline from this document. I am using BibTex to compile my refs.bib document for this paper, please let me know if my citations are done incorrectly so I can change them sooner rather than later.

2 Introduction

1. Desire for hypersonic travel commercially and narrower scopes
2. Difficulty finding polymers to withstand extreme temperature scenarios
3. High friction scenarios both with physical and gases (air resistance) need to be accounted for
4. Space stations can make use of temp withstanding polymers in either direction
5. Main concern with hypersonic travel is the lack of ability to handle friction with air
6. Explicitly state the purpose of these studies

Hypersonic travel has long been a major point of interest in the aerospace industry and scientific community alike. Speeds exceeding Mach 5 offer significant potential with respect to both commercial and defense based applications. However, the extreme temperature conditions associated with hypersonic travel pose substantial material challenges. Materials used must exhibit high thermal resistance while also being manufacturable and moldable into various complex shapes for a wide range of applications. Finding a material that meets these demanding criteria has proven to be remarkably difficult.

Polymer science has been at the heart of addressing these material concerns due to the versatility and wide range of properties that polymers offer. Unlike metals and other

commonly used materials, polymers have the potential to be incredibly lightweight solutions while also having tunable properties for specific applications. Through the study of polymers, optimized materials can be derived such that they can withstand the extreme thermal and mechanical stresses encountered when traveling at hypersonic speeds.

Discuss recent research and discuss what topics the review article will talk about(ATSP-,[1] PPTA[2]), implying a vertical vs. horizontal approach

3 Results and Discussion

1. Polymer coatings can mitigate low thermal resistance
2. Polyimides very thermo-oxidatively resistant
3. Discuss synthesis of polyimides and behavior at temperatures above 500°C
4. Thermoplastic vs. thermosey polyimides
5. Nanoparticles: their use and benefit to making travel like this possible

4 Conclusions

Restate, succinctly, the results section.

1. Discuss without logical sentences
2. Discuss possible grievances and comments
3. Discuss future solutions and ideas

References

[1] Bashandeh, K.; Tsigkis, V.; Lan, P.; Polycarpou, A. A. *Tribology International* **2021**, *153*, 106634.

[2] Li, T.; Mao, Z.; Du, J.; Song, Z. *Nanomaterials* **2022**, *12*.