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Editorial: Machining technology and environmental degradation mechanism of surface microstructure of special materials, volume II

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Editorial on the Research Topic
Machining technology and environmental degradation mechanism of surface microstructure of special materials, volume II

1 Introduction

The processing technology of material surfaces and the environmental degradation mechanism of materials before and after processing are the guarantees for the service performance of high-performance materials in engineering applications. In the Research Topic "*Machining technology and environmental degradation mechanism of surface microstructure of special materials, volume II*", focused on the surface processing and modification technologies of high-performance materials, as well as the failure forms of completed workpieces. The Research Topic reported a total of four research contents, which conducted research on the surface treatment technology of materials, the failure behavior of labor engineering, and industrial waste reproduction technology.

2 Material surface processing technology

Material surface processing is a very important step in casting materials after forming and rough machining. The quality of surface processing is related to whether the workpiece can successfully serve. Surface processing techniques are very extensive, such as polishing, pickling, shot peening, impact, modification, etc. It can be selected according to different needs. Traditional precision and ultra precision machining is to ensure the surface integrity of the machined surface. Jiang et al. proposed a trajectory planning method based on the interaction direction between grinding grains and materials. By analyzing the surface grinding experiment of titanium alloy and combining the detection results of surface integrity parameters such as surface morphology, roughness, and residual stress after

processing. Finally, the influence of the angle change between the feed direction and the grinding direction on the surface integrity parameters during grinding was clarified. This research has a guiding role in improving the surface quality of complex curved parts such as titanium alloy hollow blades.

Advanced cutting edge preparation technology is the foundation for ensuring material processing performance. Pan and Yuan summarized and reviewed on the characterization methods of cutting edge preparation, the impact of cutting edges on cutting performance, and the mechanism of cutting edge erosion. The author believes that the cutting edge geometry of the tool is intentionally modified to improve its cutting ability. In research on tools and abrasives used in honing, grinding, and coating processing, the geometric shape of the cutting edge of the tool can be changed to reduce cutting force and extend tool life.

3 Fatigue failure mechanism

The failure mechanism of the core components of high-end equipment is very complex, including environmental degradation of materials, the impact of complex working conditions on the workpiece, and the impact of the workpiece's own motion. Zhang et al. conducted an experimental analysis of the fatigue failure mechanism of aviation engine blades. Fatigue fracture experiments were conducted on the blades after ultra precision machining. The experiment was conducted on a vibration fatigue testing platform. The author tested the surface morphology and element distribution of the fractured workpiece. Finally, a simulation method for blade fatigue failure was developed. This research demonstrates the influence of ultra precision machining on the fatigue resistance of blades. The author believes that increasing grain refinement and carbon consumption can effectively improve the fatigue life of engine blades.

The influence of surface processing technology on the fatigue failure of workpieces is crucial. Different processing techniques have different effects on surface integrity parameters such as surface morphology, hardness, roughness, and residual stress. Therefore, it is crucial to conduct fatigue failure research on workpieces processed using various advanced processing technologies.

4 Industrial waste reproduction technology

Green manufacturing is an important research field that supports carbon neutrality and protects the Earth's environment. In green manufacturing, in addition to reducing processing energy consumption, the reuse of production waste is also an important means of protecting the environment. Fly ash is a highly polluting solid waste generated during the coal-fired process of thermal power plants, and improper treatment can seriously affect the environment. Yang et al. prepared a glass ceramic matrix using fly ash as raw material, successfully developed a surface modification technology, and successfully sintered the fly ash material matrix into a ceramic matrix composite material. The author used surface morphology, phase analysis, mechanical performance testing, and other methods to analyze the optimal material proportion for modification. This research greatly enhances the recycling of industrial waste.

5 Conclusion

In summary, in the Research Topic "*Machining technology and environmental degradation mechanism of surface microstructures of special materials, volume II*" researchers have mainly published articles on the surface processing technology of materials and the fatigue failure mechanism of processed workpieces. These articles respectively introduce material surface processing technology, tool preparation technology, and the fatigue failure mechanism of processed components. In addition, there is a paper showcasing the processing technology of industrial waste. This Research Topic has a certain guiding significance at the forefront of research and the application mechanism of achievements.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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