

## 结构陶瓷——承载人类文明的基石

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陶瓷, 作为人类文明史上具有里程碑意义的人工合成材料, 不仅承载着中华民族的骄傲, 更是中华民族智慧和创新精神的集中体现。经过数千年的沉淀与演化, 陶瓷已发展成为一个博大精深、丰富多彩的材料体系。传统陶瓷与先进陶瓷交相辉映, 共同构筑起人类文明的物质基石。其中, 先进结构陶瓷更是以其耐高温、抗腐蚀以及优异的力学性能等特性, 在金属材料和高分子材料难以承受的高温、腐蚀等极端环境中展现出独特的优势, 成为现代科技文明中不可或缺的关键材料。而陶瓷基复合材料不仅继承了结构陶瓷的诸多优良特性, 而且克服了其脆性问题, 因此在全球范围内受到广泛关注。在航空航天、交通运输和先进核能等领域, 陶瓷基复合材料发挥着举足轻重的作用, 为推动科技进步贡献了重要力量。

在 20 世纪 80 年代, 结构陶瓷发展达到了高峰, 诞生了如陶瓷发动机、碳石英烧蚀材料、高性能陶瓷刀具等一系列重大科技成果, 但由于材料制备和加工技术的限制, 以及产业需求驱动力的减弱, 结构陶瓷的后期发展逐渐放缓。然而, 仍有一大批科研工作者坚守在这个领域, 通过不懈努力开发出性能卓越的新型结构陶瓷材料, 他们的研究极大地拓宽了现代结构陶瓷的应用范围, 使得陶瓷这一古老而又充满活力的材料在现代科技文明中绽放出更加夺目的光芒。

受《无机材料学报》编辑部的邀请, 我们组织编撰了“结构陶瓷前沿”专辑, 特别邀请到来自西北工业大学、武汉理工大学、哈尔滨工业大学、南京航空航天大学、北京航空航天大学、国防科技大学、吉林大学、东北大学、郑州大学、长安大学、中国科学院金属研究所和中国科学院上海硅酸盐研究所等单位的国内知名研究团体, 共同分享在结构陶瓷领域的最新研究成果和应用案例。专辑内容丰富, 涵盖结构陶瓷及陶瓷基复合材料的设计与制备, 科学、新型结构陶瓷材料的研发和应用, 以及结构陶瓷的性能评价、仿真模拟和损伤机理等方面。

我们期望, 本专辑能够帮助科研人员更深入地理解结构陶瓷的内涵, 成为他们了解该领域最新发展动态的窗口, 并积极推动结构陶瓷材料发展和学科进步。最后, 衷心感谢各位专家在百忙之中为本专辑撰稿, 是他们的辛勤付出和大力支持使得本专辑得以顺利出版。

## Structural Ceramics—the Cornerstone of Human Civilization

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Ceramics are one of the earliest synthetic materials in human civilization, which is originated in China. They represent not only the nation's glory but also the testament to the wisdom and innovation of her people. After millennia, ceramics have evolved into a vital material system encompassing both traditional and advanced varieties, with structural ceramics holding a key position. Their high-temperature resistance, corrosion resistance, and superior mechanical properties endow them indispensable in harsh environments where metals and polymers are still in struggle, underscoring their role as a cornerstone of modern technological progress. Ceramic matrix composites have mitigated the brittleness of structural ceramics, garnering global attention for their irreplaceable advantages, particularly in extreme conditions like ultra-high temperatures, intense radiation, and severe corrosion, across sectors such as aerospace, transportation, and advanced nuclear energy.

Despite peaking in the 1980s with innovations like ceramic engines and high-performance cutting tools, the development of structural ceramics encountered a slump due to limitations in fabrication techniques and reduced industrial demand. Nevertheless, persistent research efforts have led to significant advancements, broadening application scope of these materials.

Invited by *Journal of Inorganic Materials*, we have curated the special issue of “Frontiers of Structural Ceramics” featuring contributions from eminent domestic research groups, including Northwestern Polytechnical University, Wuhan University of Technology, Harbin Institute of Technology, Nanjing University of Aeronautics and Astronautics, Beihang University, National University of Defense Technology, Jilin University, Northeastern University, Zhengzhou University, Chang’an University, Institute of Metal Research, Chinese Academy of Sciences, and Shanghai Institute of Ceramics, Chinese Academy of Sciences, *etc.* The special issue is delving into the design, preparation, simulation, performance evaluation, and exploration for damage mechanisms of new structural ceramics.

We aim for this publication to deepen researchers’ insights into structural ceramics, provide a platform for exploring recent advancements, and foster the progression of the field. We extend our heartfelt gratitude to the experts who contributed despite their busy schedules, acknowledging their dedication and support that made this publication possible.

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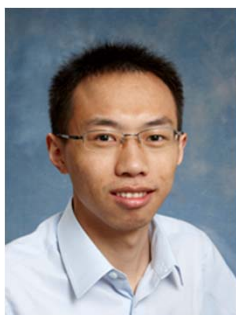
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