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温压–原位反应法制备C/C-SiC材料的压缩性能及其破坏机理

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摘 要：以短炭纤维、炭粉、Si粉、树脂和粘结剂为原料，采用温压–原位反应法(WC-ISR)制备C/C-SiC制动材料，研究该材料的压缩性能及其破坏机理。结果表明：C/C-SiC制动材料的纵向压缩强度可达118.2 MPa，纵向压缩破坏表现为韧性断裂，以对角剪切破坏方式为主；横向压缩强度可达86.9 MPa，横向压缩破坏主要表现为脆性断裂，以多层复合剪切破坏方式为主。C/C-SiC制动材料的压缩性能分别随炭纤维和SiC含量的增加而增大，且炭纤维含量的影响更加显著；但随基体炭含量的增加而降低。

关键字： C/C-SiC；温压–原位反应法；压缩性能；破坏机理

Compressive properties and fracture mechanism of C/C-SiC composites prepared by WC-ISR

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Abstract:C/C-SiC braking composites were fabricated by warm compressed in-situ reacted process (WC-ISR) with short carbon fibers, graphite powder, Si powder and resin. The compressive properties and fracture mechanism of C/C-SiC braking composites were investigated. Rules about the compressive properties and fracture mechanism of the C/C-SiC composites were ascertained. The results show that the value of vertical compressive strength can reach 118.2 MPa, whose destruction belongs to toughness fraction mechanism by shear stress and is mostly destroyed on the cross. As for the parallel compressive strength, it’s value can reach 86.9 MPa, whose destruction belongs to brittleness fracture mechanism and is destroyed by multilayer complex split. The compressive properties increase along with the increase of adding carbon fiber and SiC matrix separately, and carbon fiber carries more weight. However, the more the carbon matrix, the lower the compressive properties.

Key words: C/C-SiC; warm compressed in-situ reacted process; compressive properties; fracture mechanism

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