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$TiC-TiB_2$增强$MoSi_2$复合材料的力学性能及抗氧化行为

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摘 要： 以$MoSi_2$、Ti和B_4C粉为原料，采用高温热压技术合成不同体积分数$TiC-TiB_2$增强$MoSi_2$复合材料，研究$TiC-TiB_2$颗粒对$MoSi_2$基体材料显微组织、力学性能和高温氧化性能的影响。结果表明：30%$TiC-TiB_2$/$MoSi_2$(体积分数)复合材料的抗弯强度和维氏硬度分别达到468.3 MPa和17.07 GPa，比纯$MoSi_2$的分别增加了63.2%和83.5%。随着$TiC-TiB_2$体积分数的增加，复合材料的断裂方式由以沿晶断裂为主向以穿晶断裂为主转变，强化机制是细晶强化和弥散强化。在800~1 200 ℃氧化192 h时，30%$TiC-TiB_2$复合材料的增质是10%$TiC-TiB_2$复合材料的2.38~3.23倍。氧化层中没有发现低熔点的B_2O_3，而TiO_2和SiO_2的存在使材料具有较好的抗氧化性。

关键字： $MoSi_2$；复合材料；TiC；TB_2；力学性能；氧化行为

Mechanical properties and oxidation resistance behavior of $TiC-TiB_2$ reinforced $MoSi_2$ composites

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Abstract: $TiC-TiB_2$/$MoSi_2$ composites with different volume fractions of $TiC-TiB_2$ particles were fabricated by hot press technology using $MoSi_2$, Ti and B_4C powders as raw materials. Effects of $TiC-TiB_2$ particles on microstructure, mechanical properties and oxidation resistance properties of $MoSi_2$ matrix were investigated. The results show that the flexure strength and hardness of 30%$TiC-TiB_2$/$MoSi_2$ composite are 468.3 MPa and 17.07 GPa, respectively. Compared with monolithic $MoSi_2$, the flexure strength and hardness are enhanced by 63.2% and 83.5%, respectively. With the $TiC-TiB_2$ particles

content increasing, the fracture mechanism of the composites changes from intergranular fracture to transgranular fracture. The strengthening mechanisms of the composites are grain refine and dispersion strengthening. Oxidizing at 800−1 200 ℃, the mass gain of 30%TiC-TiB_2 composites is almost 2.38−3.23 times as much as that of 10%TiC-TiB_2/$MoSi_2$ composites. Low melting glass phase of B_2O_3 can not be found in the oxidized layer, but TiO_2 and SiO_2 existing in the oxidation layer make TiC-TiB_2/$MoSi_2$ composites have good oxidation resistance.

Key words: