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A359-Zr$(CO_3)_2$体系反应合成复合材料的干滑动磨损性能

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摘 要: 研究了新型反应体系A359-Zr$(CO_3)_2$熔体反应法制备的$(Al_3Zr+Al_2O_3)_p$/A359复合材料干滑动磨损性能。结果表明: 复合材料的磨损量随着载荷的增大和时间的延长均远小于基体磨损量, 由于颗粒的支撑和减磨作用, 使得同一条件下复合材料的磨损量随颗粒体积分数的增加而减少; 当载荷为98 N时, 12%$(Al_3Zr+Al_2O_3)_p$/A359复合材料的磨损量为20.2 mg, 而基体材料的磨损量为54.5 mg, 复合材料比基体材料耐磨性提高了2.5倍; 由磨损表面SEM观察表明, 基体A359合金存在严重粘着和变形, 表现为粘着磨损和剥层磨损, 复合材料的磨损类型表现为磨粒磨损。

关键字: $(Al_3Zr+Al_2O_3)_p$/A359复合材料; 熔体反应法合成; 耐磨性; 磨损机制

Dry sliding wear characteristics and mechanism of in-situ composites synthesized by A359-Zr$(CO_3)_2$ reaction system

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Abstract: $(Al_3Zr+Al_2O_3)_p$/A359 composites were fabricated by direct melt reaction method in novel system A359-Zr$(CO_3)_2$. The dry sliding wear properties of these composites were studied. The results show that the wear mass loss of $(Al_3Zr+Al_2O_3)_p$/A359 composites is less than that of A359 matrix alloy with increasing load and sliding time. The wear mass loss of $(Al_3Zr+Al_2O_3)_p$/A359 composites decreases further with the increase of Al_3Zr and Al_2O_3 volume fraction under the same condition because of Al_3Zr and Al_2O_3 supporting and reducing milling. Under the condition that the load is 98 N, the wear mass loss of 12%$(Al_3Zr+Al_2O_3)_P$/A359 composites is only 20.2 mg, whereas the wear mass loss of A359 matrix alloy is 54.5 mg. Thus the wear-resisting property of this composite is enhanced by 2.5 times than its matrix A359 alloy. The observation of wear surface of $(Al_3Zr+Al_2O_3)_p$/A359 composites and the matrix A359 alloy with the help of SEM indicates that severe adhesion and deformation occurs on the wear surface of A359 alloy. The wear mechanism of the matrix A359 alloy is stripped and adhesive wear, while the wear surface of $(Al_3Zr+Al_2O_3)_p$/A359 composites is superior to that of the matrix A359 alloy. The wear mechanism of $(Al_3Zr+Al_2O_3)_p$/A359 composites is abrasive wear.

Key words: $(Al_3Zr+Al_2O_3)_p$/A359 composites; direct melt reaction synthesis; wear-resistance; wear mechanism