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外加载荷对Al_2O_3·$SiO_{2(sf)}$/AZ91D复合材料磨损性能的影响

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摘 要：分别以硅酸铝短纤维和磷酸铝为增强体和预制体高温粘结剂，采用挤压浸渗法分别制备出体积分数为15%、20%、25%和30%的镁基复合材料。利用MM200磨损试验机，分别在外加载荷为10、20、30、40和50 N及滑动速度为0.47和0.94 m/s条件下，与硬度为HRC53的20Cr对磨环在干态条件下进行对磨，考察了外加载荷对不同体积分数硅酸铝短纤维增强AZ91D镁基复合材料试样磨擦率和磨损机制的影响，并通过扫描电镜对试样摩擦表面进行了形貌观察和分析。结果表明：在低滑动速度(0.47 m/s)下，复合材料的磨损机制随着外加载荷的改变而改变；而在高滑动速度(0.94 m/s)条件下，则没有这种改变；在干磨条件下，试样磨损率随体积分数的变化受到外加载荷和滑动速度的影响。

关键字：硅酸铝纤维；镁基复合材料；外加载荷；体积分数；磨损率

Effect of applied loads on wear properties of Al_2O_3-$SiO_{2(sf)}$/AZ91D composites

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Abstract: Magnesium alloy matrix composites(MMC) with volume fractions of 15%, 20%, 25% and 30% were fabricated by squeeze cast using crystallized aluminum silicate short fibers as reinforcement and aluminum phosphate as binder under high temperature, respectively. The dry sliding tribological properties of the magnesium alloy matrix composites were studied using MM200 wear tester (block-on-ring configuration) against a hardened alloy steel counterface with hardness of HRC53 under loads of 10, 20, 30, 40 and 50 N and sliding velocities of 0.47 and 0.92 m/s. The effects of applied loads on the dry sliding tribological properties of Al_2O_3·$SiO_{2(sf)}$/AZ91D composites with different volume fractions were investigated. The examinations on the work surface of wear test specimens were conducted by scanning electron microscopy(SEM). The results show that, the wear mechanism of the composite changes with changing applied loads under sliding speed of 0.47 m/s.

But the wear mechanism does not change under sliding speed of 0.94 m/s. The effect of sliding speeds on wear rate of the MMCs specimens is greater and more complex than that of the AZ91D matrix alloy. The relationship between wear rate and volume fraction of the composite is influenced by applied loads and sliding speeds under dry friction.

Key words: aluminium silicoate fiber; magnesium matrix composite; applied load; volume fraction; wear rate