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不同载荷下C/C复合材料往返式滑动摩擦行为

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摘要: 以GCr钢球为对偶, 在UMT-3微摩擦试验机上测试2种具有不同基体炭结构的C/C复合材料长时间往返式滑动摩擦磨损行为。研究表明: 在相同载荷下, 具有粗糙层热解炭基体的材料A的平均摩擦因数高于具有光滑层/树脂炭基体的材料B平均摩擦因数; 在60 N时, 材料A的平均摩擦因数出现最大值, 为0.193; 而材料B的平均摩擦因数出现最低值, 为0.120; 随着载荷的增加, 2种材料的平均摩擦因数均出现较大的波动, 其中: 材料A的平均摩擦因数变化趋势为先升后降, 材料B的平均摩擦因数先降后升, 但二者的差值随载荷增加先增后减; 随着时间的延长, 所有试样的摩擦因数均逐渐趋于稳定; 材料A的摩擦表面膜较完整、致密, 但存在大块摩擦膜剥落或交替堆叠; 材料B的摩擦表面较粗糙, 形成纤维与基体炭分开堆积成膜形貌。

关键字: C/C复合材料; 往返式摩擦; 载荷

To-fro sliding tribological behavior of C/C composite under different loads

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Abstract: Two C/C composites with different carbon matrixes were prepared. The long-term to-fro friction and wear behavior of theirs were tested against GCr steel mates in UMT-3 wear tester under different applied loads. The results show that the average coefficients of friction (COF) of composite A with rough lamination pyrocarbon matrix (RL) are larger than those of composites B with smooth lamination pyrocarbon/resin carbon matrix (SL/RC). The largest average COF of composites A is 0.193 produced under 60 N, while the least COF of composites B is 0.120 produced under 60 N. The gap on the average COF among the two composites increases at first and then decreases with the increase of the loads. With the prolonging time, all the COFs become stable. The worn surface of composites A forms by smooth and integrated friction film in spite of some big cracks, large block peeled film and alternately piled up film. For composites B, the rough friction film is composed of thick matrix carbon debris film and thin carbon fibers film.

Key words: C/C composites; to-fro friction behavior; loads

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