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Moderation in Temperature Dependence on Counter Frictional Coefficient and Prevention of Wear of C/C Composites by Synthesizing SiC around Surface and Internal Vacancies

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Abstract : The aim of this study is to moderate the dependence of counter frictional coefficient on temperature between counter surfaces and to reduce the wear of C/C composites at low temperature. To modify the C/C composites, Silica (SiO₂) powders were added into phenolic resin for carbon precursor. The preform plate of the precursor of C/C composites was prepared by conventional filament winding method. The C/C composites plates were obtained by carbonizing preform plate at 2200 °C under an argon atmosphere. At that time, the silicon carbides (SiC) were synthesized around the surfaces and the internal vacancies of the C/C composites. The frictional coefficient on the counter surfaces and specific wear volumes of the C/C composites were measured by our developed frictional test machine like pin-on disk type. The XRD indicated that SiC was synthesized in the body of C/C composite fabricated by current method. The results of friction test showed that coefficient of friction of unmodified C/C composites have temperature dependence when the test condition was changed. In contrast, frictional coefficient of the C/C composite modified with SiO₂powders was almost constant at about 0.27 when the temperature condition was changed from Room Temperature (RT) to 300 °C. The specific wear rate decreased from 25×10⁻⁶ mm²/N to 0.1×10⁻⁶ mm²/N. The observations of the surfaces after friction tests showed that the frictional surface of the modified C/C composites was covered with a film produced by the friction. This study found that synthesizing SiC around surface and internal vacancies of C/C composites was effective to moderate the dependence on the frictional coefficient and reduce to the abrasion of C/C composites.

Keywords : C/C composites, friction coefficient, wear, SiC
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