The Wear Properties of CFR-PEEK-OPTIMA Articulating Against Ceramic Assessed on a Multidirectional Pin-on-Plate Machine


Attempts to extend the usability lifespans of rubbing implantable devices have introduced new materials as joint couplings. Investigating the suitability of CFR-PEEK-OPTIMA® as a joint coupling material, this study evaluates pitch and PAN (polyacrylonitrile)-based carbon fibre reinforced-polyetheretherketone (CFR-PEEK-OPTIMA) pins articulating against both BioLox Delta and BioLox Forte ceramic materials.

Methods:
Multidirectional pin-on-plate machine tests were conducted to determine the wear of both pitch and PAN (polyacrylonitrile)-based carbon fibre reinforced-polyetheretherketone (CFR-PEEK-OPTIMA) pins articulating against both BioLox Delta and BioLox Forte plates (ceramic materials). Reciprocation and rotational motion were applied to the samples. 24.5 per cent bovine serum was used as the lubricant (protein concentration 15 g/l).

Results and Discussion:
Though all material combinations gave similar low wear with no statistically significant difference (p > 0.25), the lowest average total wear of these pin-on-plate tests was achieved by CFR-PEEK-OPTIMA pitch pins versus BioLox Forte plates, for a significantly lower wear rate than those produced by conventional joint materials (metal-on-polyethylene and metal-on-metal combinations) during pin-on-plate machine testing.

Conclusions:
CFR-PEEK-OPTIMA pitch pins produced the lowest average total wear; suggesting that PEEK-OPTIMA-based material combinations may perform well in joint applications.
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