Fiber Direction Effect on Thermal Conductivity of PEEK Composites.

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Thermal conductivity of polyetheretherketone (PEEK) composites filled with various conduction filler such as carbon fiber, silicon carbide, boron nitride, multi-walled carbon nanotube was investigated. Thermal conductivity of composites were increased to 6.78 W/m-K for hybrid filler of (CF_{DKD}+SiC) 7:1 ratio system, whereas that of hybrid filler 1:1 filler ratio was 4.8 W/m-K at 40 vol%.

Thermal conductivity was also varied by processing time, processing method, fiber aspect ratio, polymer size, as well as fiber direction. As increasing processing time, the thermal conductivity was decreased from 5.5 W/m-K to 1.9 W/m-K for 5 minutes mixing and 20 minutes mixing, respectively. Fiber aligned composites parallel to incident laser beam gave a higher thermal conductivity than those of perpendicular to incident beam. The electrical resistance of PEEK/CF(40 vol%) at parallel direction was lower than that of perpendicular direction. However, the electrical resistance of CF/SiC (30 vol%/10 vol%) hybrid filler composites were $2.9 \times 10^6\ \Omega \cdot cm$ and $1.5 \times 10^7\ \Omega \cdot cm$ for perpendicular and parallel fiber direction, respectively. It is speculated that the non-conducting SiC particles may inhibit easy electron conduction at parallel direction.