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TRIBOLOGICAL PROPERTIES AND GEAR STRENGTH OF VARIOUS CARBON FIBERS FILLED PBT COMPOSITES

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The purpose of this study is to investigate the tribological properties and gear strength of various carbon fibers (CF) filled polybutylene terephthalate (PBT) composites. Four types of carbon fiber: polyacrylonitrile based carbon fiber (PAN-CF), pitch based carbon fiber (Pitch-CF) and two kinds of vapor grown carbon nanofiber (VGCF and VGCF-S) were filled with PBT. The initial values of average length /diameter of PAN-CF, Pitch-CF, VGCF and VGCF-S were 6mm /7μm, 700μm /13μm, 10μm /150nm, and 10μm /100nm, respectively. These CF/PBT composites were compounded by a twin screw extruder and injection-molded. Tribological properties were evaluated by pin-on-plate typed and ring-on-plate typed sliding wear testers under dry condition. Two kinds of strength of the gear machined from these CF/PBT composites were evaluated: dedendum bending strength of the spur gear by universal tester and gear fatigue strength by using power absorbing typed gear testing apparatus. The frictional coefficient of various CF/PBT composites showed different behavior according to the type of CFs. The dedendum bending strength of the spur gear increased with the following order: Pitch-CF < VGCF < PAN-CF < VGCF-S. This order is same as that of aspect ratio of CFs. The higher the fiber content increased, the higher the gear fatigue strength obtained from *S-N* curves using an absorbing typed gear testing apparatus improved. The gear fatigue strength shows a positive fiber content dependence, and increases with the following order: VGCF < PAN-CF < Pitch-CF < VGCF-S.