

Experimental composites made of electron beam irradiated reinforced fillers.

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This study investigated the influence of electron beam irradiated reinforced fillers on the three body wear and flexural strength of experimental composite blends. Three formulations of reinforced fillers were investigated: (A) high loaded inorganic filler composite with 60 wt.% SiO₂, (B) low loaded inorganic filler composite with 40 wt.% SiO₂, (C) organic filler composite (precipitated Bis-phenol-A-di-methacrylate). The fillers were assigned to two subgroups of unswollen (A, B, C) and monomer swollen (As, Bs, Cs) fillers. The experimental blends (matrix: Urethane-dimethacrylate) were mixed using un-treated, annealed (90 degrees C), or electron beam irradiated fillers with 30 and 90 kGy, respectively. All specimens were heat-cured for 20 min at 140 degrees C. Three-body abrasion and flexural strength tests were performed. The highest flexural strength was evaluated for composites made of the 30 kGy irradiated type Bs filler. The comparison with annealed fillers showed that the effect was independent of increasing temperatures during the radiation process. Blends with a SiO₂ content of 60 wt.% (type A, As) had significantly less wear than blends with 40 wt.% (type B, Bs) or blends with organic fillers (type C, Cs). The flexural strength of the composite could be improved by using pre-irradiated reinforced fillers. However, wear was not affected using this procedure.

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