

The influence of electron beam irradiation on fibre-reinforced composite specimens.

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This study investigated whether glass fibre-reinforced composite (FRC) specimens can benefit from post-curing using electron beam irradiation. Twenty-four frameworks of the Vectris and 24 of the Stick glass fibre-reinforced system were veneered with their correspondent veneer materials. Eight specimens of both systems were post-cured using electron beam irradiation (3 x 33 kGy, 10 MeV). The specimens were fixed in a restrained-end apparatus and inserted in an artificial mouth. With the exception of controls (n = 8 each) all other groups were thermally cycled and mechanically loaded (TCML). Finally, all samples were loaded to fracture using a universal testing machine. In two of eight non-irradiated Vectris/Targis specimens facing fracture occurred during TCML. Irradiation avoided these failures. No Stick/Sinfony facing fractured. However, Stick frameworks showed considerable torsions. Post-curing with electron beam irradiation made Stick frameworks stiffer. The fracture load of irradiated Stick/Sinfony specimens reached 520 +/- 31 N; control (without TCML and irradiation) 396 +/- 14 N, TCML-group without irradiation 362 +/- 41 N. Irradiated Vectris/Targis had a fracture resistance of 575 +/- 57 N; the control 556 +/- 36 N and the TCML group without irradiation 383 +/- 51 N. This investigation demonstrated that different types of FRC systems could considerably benefit from electron beam irradiation. The reconstructions became stiffer and resisted higher load.

PMID: 16671992 [PubMed - indexed for MEDLINE]