

Flexural strength of experimentally filled resins made of electron beam irradiated silica fillers

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Abstract

This study investigated the influence of different silica fillers on the flexural strength of experimentally filled resins. Hydrophilic (non-silanated) silica, hydrophobic silica modified by organofunctional silane, and silica modified by organofunctional silane that additionally contains polymerizable carbon double bonds were assigned into further subgroups: the first subgroup was electron beam irradiated with 10 kGy (dose rate) and the second with 30 kGy, whereas the third constituted the non-irradiated control group. In total, nine experimentally filled resin blends were mixed. Rectangular specimens were constructed, and a flexural strength test was performed. Regardless of the type of silica, specimens constructed of blends containing non-irradiated fillers showed the lowest flexural strength in comparison to their corresponding irradiated groups. With increasing dose rates from 10 to 30 kGy, filler irradiation prior to blend mixing resulted in slightly increased flexural strength values for hydrophilic as well as for organofunctional silanated silica. Specimens constructed of blends with fillers that were not only modified by silane containing polymerizable carbon double bonds but were additionally irradiated showed the highest flexural strength. The results of this study indicate that the flexural strength of filled resins could be enhanced by advance preparation of silica fillers with silane coupling agents followed by electron beam irradiation.

Keywords: Filled resins; Electron beam irradiation; Silane; Silica filler; Flexural strength