

# 1972 Network competition in a resin-modified glass-ionomer cement

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Attempts have been made to improve the mechanical properties and convenience of use of glass-ionomer cement (GIC) by various modifications, e.g. including a free-radical polymerizable component ("resin-modified" GIC, RMGIC). Necessarily, the one replaces part of the other, but the chemistry suggests that the formation of each network separately would inhibit diffusion and thus the other reaction. **Objectives:** To determine the variation in the 24-h compressive strength of an RMGIC with irradiation regime. **Methods:** Cylindrical specimens (6 mm × 3 mm diameter) of one brand of RMGIC (Shades A3, D2; Fuji II LC, GC; capsules) were prepared in ptfе moulds. After machine-mixing for 10 s, 3 increments were irradiated from the top for various times (0 to 60 s: from the top only, top + bottom; top + bottom + side after ejection; with two lamps; at various delays after mixing (2 min to 18 h); 4 replicates of each. After exposure, or as appropriate, specimens were wrapped tightly in aluminium foil for storage dry in the dark at 37°C for testing at 24 h after mixing. Specimens with evident defects were replaced before testing. **Results:** For top-only irradiation, strength rose from the unirradiated value ( $66 \pm 9$  MPa) to a peak at 20 s (manufacturer's recommendation) ( $215 \pm 25$ ), after which it declined steadily. Adding bottom illumination gave a small decrease in peak value ( $194 \pm 36$ ); adding side illumination reduced it substantially ( $113 \pm 7$ ). Delay for 2 min gave a marked reduction ( $155 \pm 15$ ), declining to the unirradiated value at 18 h ( $70 \pm 15$ ). No effect due to shade was detected. **Conclusions:** Competition between network-forming reactions leads to a sensitive balance between the two, and a critical optimum irradiation: too much may be detrimental, as is delay. The essential compromise involved in mixed chemistry jeopardizes reliability.

[Seq #161 - Keynote Address and New Materials and Improved Understanding of Dental Polymers](#)

1:30 PM-3:30 PM, Friday, 30 June 2006 Brisbane Convention & Exhibition Centre Plaza Terrace

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