Polymerization contraction of a silorane-based resin composite and four methacrylate-based composites

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INTRODUCTION: All present-day resin composites contract as a consequence of polymerization. New types of ring-opening monomers have been described in the literature [1]. Theoretically, such monomers have less polymerization contraction than methacrylate monomers. It was the aim of the present study to measure the polymerization contraction of a silorane-based resin composite and to compare this contraction with that of methacrylate-based composites.

METHODS: The resin composites investigated are shown in Table 1. The first material, Hermes, is a silorane-based composite; four methacrylate-based composites were used as controls.

Table 1. List of composites used in the investigation.

Composite	Manufacturer
Hermes	3M ESPE
Tetric EvoCeram	Ivoclar Vivadent
QuixFil	Dentsply DeTrey
Premise	sds Kerr
Prodigy Condensable	sds Kerr

The polymerization contraction was measured by the deflecting disc method [2]. The irradiation was carried out with a light-curing unit (XL3000, 3M ESPE, St. Paul, MN, USA). The power density was 450 mW/cm^2 and the exposure duration was 20 s and, in the case of Hermes, also 40 s. Dimensional changes were determined continuously for 120 s and then at 60 min (n = 5).

RESULTS: The results are presented in Table 2. It appears that Hermes had the lowest polymerization contraction and Prodigy Condensable the highest, both at 60 s and at 60 min.

DISCUSSION & CONCLUSIONS: The foregoing has shown that the novel silorane-based resin composite had significantly lower polymerization contraction than the methacrylate-based composites investigated. This would appear to indicate that ring-opening has in fact taken place with a concomitant contraction that is relatively small. The finding that there was no significant difference in polymerization contraction of Hermes exposed to light for 20 s and for 40 s indicates that an exposure duration of 20 s is sufficient to give optimal cure to a layer having a thickness of about 2 mm. The relatively slow shrinkage of Hermes possibly represents an advantage in relation to faster shrinking materials in that smaller and less extended marginal gaps may result from this "intrinsic soft-start" [3].

Table 2. Polymerization contraction C (%) of the composites investigated at 60 s and at 60 min. Mean values ± SD.

Composite	C at 60 s	C at 60 min
Hermes (20 s)	^{a}0.78 ± 0.07	^{a}1.01 ± 0.07
Hermes (40 s)	^{a}0.76 ± 0.03	^{a}1.05 ± 0.04
EvoCeram	^{b}1.05 ± 0.03	^{b}1.36 ± 0.05
QuixFil	^{c}1.23 ± 0.03	^{c}1.58 ± 0.04
Premise	^{d}1.35 ± 0.06	^{c}1.59 ± 0.12
Prodigy C	^{e}1.97 ± 0.09	^{d}2.33 ± 0.10

In each column, values with same superscript are not significantly different at $P = 0.05$.

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