

- Conversion vs. shrinkage of N'Durance, Dimer Acid based Nanohybrid Composite
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Several approaches to improved dental composites have been studied. One of these approaches is to increase the biocompatibility by increasing the monomer conversion and thereby reducing the elution of components. Great strides have been made, but manufacturers battle the problem of an increase in shrinkage contraction and stress when the monomer conversion increases.

Objectives: To determine the relationship between Monomer conversion and volume shrinkage of the new N'Durance, dimer acid based nanohybrid composite, compared to 16 different commercialized products.

Methods: The polymerization shrinkage was measured using a linometer from ACTA. Monomer conversion was calculated by nearIRmeasuring the peak area corresponding to C=C bond before and after polymerization. The % of double bond conversion was calculated using the equation:

$$\text{Conversion \%} = 1 - \frac{A_{\text{CURED}}}{A_{\text{UNCURED}}} \times 100$$

Specimens were polymerized using a quartz-tungsten-halogen lamp with an intensity of 500 mW/cm², during 40 seconds whatever the test is.

Results:

Product	Manufacturer	Type	Monomer conversion %	Volume Shrinkage %
Image	Septodont	Universal/Microhybrid	59.0±1.4	2.3±0.3
N'Durance		Universal/Nanohybrid	75.0±1.5	1.4±0.4
Filtek-Supreme+	3M-ESPE	Universal/Nanofilled	47.2±6.5	1.9±0.2
Filtek-Z100		Universal/Microhybrid	57.5±1.3	2.1±0.3
Filtek-Z250		Universal/Microhybrid	52.5±1.2	1.9±0.4
Esthet-X	Dentsply-Caulk	Universal/Microhybrid	60.7±5.6	3.0±0.3
TPH3		Universal/Nanohybrid	52.5±6.4	2.5±0.5
Gradia-Direct-A	GC-America	Anterior/Microfilled	42.5±2.1	2.2±0.1
Gradia-Direct-P		Posterior/Microfilled	47.5±5.0	2.0±0.1
Solitaire2	Heraeus-Kulzer	Posterior/Condensable	64.1±1.9	3.0±0.1
Heliomolar	Ivoclar-Vivadent	Universal/Microfilled	41.8±2.8	1.5±0.1

Product	Manufacturer	Type	Monomer conversion %	Volume Shrinkage %
Alert	Jeneric-Pentron	Posterior/Condensable	61.5±3.5	2.8±0.2
Artiste		Universal/Nanofilled	56.6±2.2	2.4±0.4
Simile		Universal/Nanohybrid	56.1±2.0	2.4±0.3
Herculite-XRV	Kerr	Universal/Microhybrid	64.6±1.5	2.8±0.1
ELS	Saremco	Universal/Microhybrid	54.0±3.5	1.7±0.3
Grandio	VOCO	Universal/Nanohybrid	44.7±3.0	2.0±0.2

Conclusions: Trying to increase the final double bond conversion to reduce the unreacted monomers, of the marketed products, which use conventional resin Bis-GMA – TEGDMA, the volumetric shrinkage also increased. N'Durance, which uses a new resin system based on a dimer acid derivative monomer, shows a unique response: high conversion and low polymerization shrinkage.