

- Characterization of a new dimer acid based resin nano-hybrid composite
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A new “Low Shrinkage Nano-Hybrid Composite” (LSNHC) was developed using a free radically polymerizable dimer acid dimethacrylate which copolymerizes with existing monomers and a filler system which contains a new Ytterbium Fluoride mono dispersed nano sized particles, combined with regular Silica and Barium glass, to obtain dental composites. This composite compensates for shrinkage by phase separation

Objectives: To determine the Physical Properties of the new LSNHC compared to: Crystalline® (Confi-Dental Products Co), ELS (Saremco), Esthet-X (Caulk-Dentsply), Filtek Supreme+, Filtek Z250 (3M-ESPE) and Grandio (VOCO).

Methods: Compressive and flexural strength, flexural modulus, water sorption and solubility were determined according to the International Standard ISO 4049 and ADA specification 27. Diametral Tensile Strength (DTS) was measured using a similar test method as compressive strength. Monomer conversion was calculated by near-IR. The polymerization shrinkage was measured using a linometer. Shrinkage stress was measured with an ADAHF Tensometer. Specimens were polymerized using a visible light lamp with an intensity of 500 mW/cm², following the manufacturer instructions.

Results:

Physical Criteria	LSNHC	Crystalline	ELS	Esthet-X	Filtek Supreme Plus	Filtek Z250	Grandio
Compressive strength, MPa	290±19	253±23	293±16	251±31	271±51	310±22	238±18
DTS, MPa	51.88±2.37	47.00±1.57	45.17±5.73	53±1	60.00±2.10	62.43±6.22	57.33±4.69
Flexural strength, MPa	117±9	115±11	119±12	102±8	124±16	144±15	126±20
Flexural modulus, GPa	8.50±7.01	6.87±3.86	6.58±7.61	7.73±1.80	12.04±3.65	15.47±7.17	14.37±4.36
C=C conversion, %	75.01±1.53	58.97±1.40	48.73±2.58	59.39±1.58	47.20±6.53	60.43±6.22	44.72±2.98
Polymerization Shrinkage, %	1.19±0.25	1.99±0.19	1.29±0.17	2.61±0.28	1.52±0.17	1.65±0.19	1.67±0.03
Shrinkage stress, MPa	1.07±0.10	1.97±0.02	1.23±0.10	2.26±0.07	2.00±0.45	2.37±0.14	1.86±0.02
Water sorption, µg/mm ³	7.19±0.70	14.51±1.38	16.03±1.36	17.25±0.97	28.45±0.95	19.82±0.79	14.42±2.22
Water solubility, µg/mm ³	0.00±0.02	0.24±0.07	0.67±0.07	0.91±0.63	0.52±0.06	0.61±0.34	1.23±1.12

Conclusions: The New Dimer Acid based Nano-Hybrid Composite shows the higher monomer conversion without deteriorating other properties such as volume shrinkage, shrinkage stress and strength. This increase leads to a decrease in the water uptake.

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