PRE-HEATED COMPOSITE: TEMPERATURE EFFECT ON MONOMER CONVERSION AND CONTRACTION STRESS

MÁRCIA DARONCH[1,2], FERNANDA CALHEIROS[1], ROBERTO BRAGA[1], FREDERICK A. RUEGGEBERG[2] , MARIO F. DE GOES[3]

[1]School of Dentistry,Univ. of São Paulo (Brazil), [2] Medical College of Georgia (USA), [3]Dental School of Piracicaba at UNICAMP (Brazil)

P # 8

Márcia Daronch
marciadaronch@yahoo.com.br

INTRODUCTION

Recently, it was demonstrated that pre-heating a commercial composite prior to photo-activation significantly increases monomer conversion, possibly reducing the light exposure duration (Daronch *et al*., 2005). However, temperature increase is associated with higher rates of conversion, which could result in elevated values of contraction stress.

This study investigated the influence of composite curing temperature and light-exposure duration on monomer conversion and contraction stress of a commercial micro-hybrid resin composite.

HYPOTHESES:

1. An elevation in composite temperature prior to curing increases monomer conversion and contraction stress values;
2. Pre-heated composite requires shorter exposure duration to achieve similar conversion values as those seen when using conventional exposures at room temperature, and, therefore, the contraction stress may be reduced.

MATERIALS AND METHODS

✓ Composite: Esthet•X (Caulk-Dentsply), shade A2

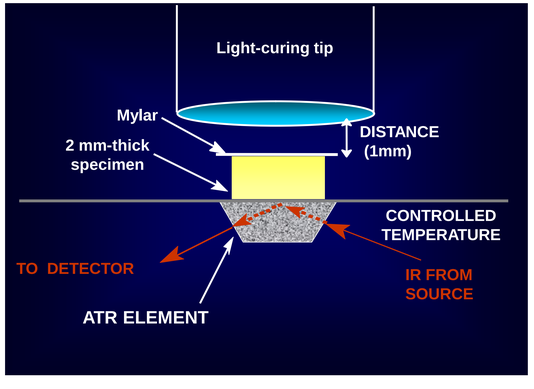
✓ QTH conventional light-curing unit: Optilux 501(Kerr), 630 mW/cm^2

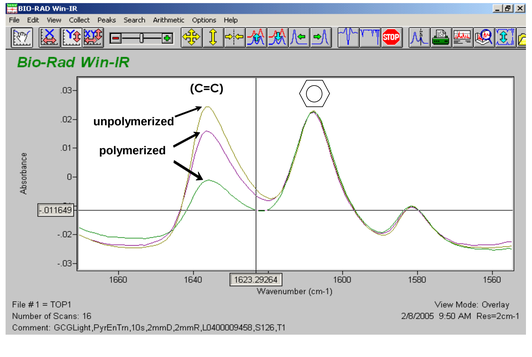
✓Light-exposure durations: 5s or 20s (control)

✓ Composite pre-cure temperatures: 22° C (control) / 60° C

MONOMER CONVERSION ANALYSES

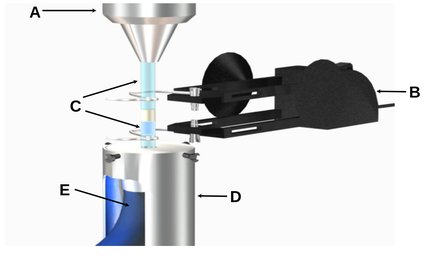
FTIR – ATR SPECTROSCOPY- FTS-40 (Digilab/Bio-Rad)





CONTRACTION STRESS TEST

Flat, sandblasted glass rod surface | Silane application | bonding agent application



Contraction stress test set-up

A: chuck connected to the load cell

B: Extensometer

C: Glass rods

D: Metalic fixture for light-curing tip (**E**)

Data were analyzed with t-test, 2-way ANOVA and Tukey test (α=5%)

FAPESP (03/13002-0 e 03/03686-9)

CAPES (03/48031)

RESULTS

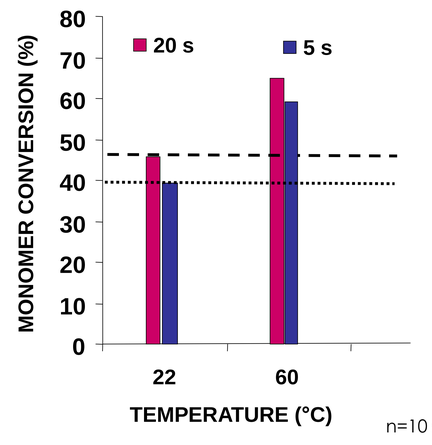
Temperature (ºC) / exposure duration (s)	Monomer conversion (%)	Max. Contraction stress (MPa)	Final Contraction stress (MPa)	Relaxation (%)
22 / 5	39.1 (7.1)c	1.6 (0.2) D	1.6 (0.3) b	0.5
22 / 20 (control)	47.2 (1.9)b	5.2 (1.1) B	5.1 (1.1) a	0.0
60 / 5	59.4 (5.4)a	3.2 (0.7) C	2.7 (0.8) b*	15.5
60 / 20	64.7 (2.0)a	6.9 (0.6) A	5.2 (1.0) a**	25.4

Within a column, groups identified with similar letters are not statistically different, $p > 0.05$

* t-test between Max and Final stress: $p = 0.055$

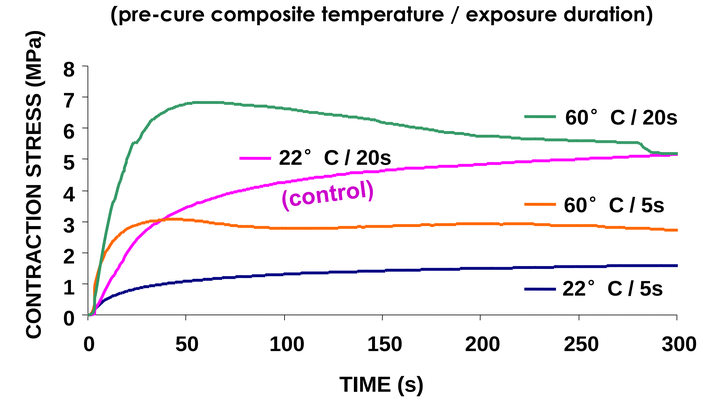
** t-test between Max and Final stress: $p < 0.01$

EFFECT OF TEMPERATURE AND EXPOSURE DURATION ON MONOMER CONVERSION



EFFECT OF TEMPERATURE AND EXPOSURE DURATION ON CONTRACTION STRESS

(pre-cure composite temperature / exposure duration)



n=10 specimens per experimental group

CONCLUSIONS

Both hypotheses were accepted. Based on limitations imposed, the following conclusions may be drawn:

✓ **For equivalent exposure durations, temperature increase produced higher monomer conversion and contraction stress values.**

✓ **Pre-heated composite allowed use of shorter exposure duration of 75%, producing higher conversion and lower contraction stress than control.**