# Shear Bond Strength of Ceramic Primers with Lithium Disilicate

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**Poster #1083**

## INTRODUCTION

Adhesive cementation plays an important part in the clinical success of esthetic restorations. The etching and priming step is a critical step during adhesive cementation which performs the following processes - creation of a micro-retentive surface and the activation of the surface for the subsequent chemical bonding procedure using a bonding agent. This bonding agent, a silane methacrylate, ensures a durable chemical bond between the glass-ceramic and the methacrylate-based luting composite. The longevity of the restoration can be dependent on the stability of this bond in an aqueous environment during stress. One method for testing the longevity of the bond is thermocycling.

## OBJECTIVE

To compare the shear bond strength of resin cements with lithium-disilicate as a function of ceramic primers and artificial aging.

## MATERIALS AND METHODS

### Materials


Monobond® Etch & Prime
Ivoclar Vidadent Inc.
Lot # U12508

IPS e.max® CAD
Ivoclar Vivadent, Inc.
Lot# 522131

Scotchbond™ Universal / RelyX™ Ultimate
3M ESPE
Lot # 577566 / 602839

Adhese® Universal / Variolink® Esthetic DC
Ivoclar Vivadent Inc.
Lot # SM0036 / T27196


Optibond™ XTR / NX3 Nexus™
Kerr
Lot # 602839 / 5314469

Tetric EvoCeram® Bulk Fill (IVA)
Ivoclar Vivadent, Inc.
Lot # U16982

bluephase® G2
Ivoclar Vivadent Inc.
Serial # 110003235

### Experimental Method:

**A) Specimen Preparation**



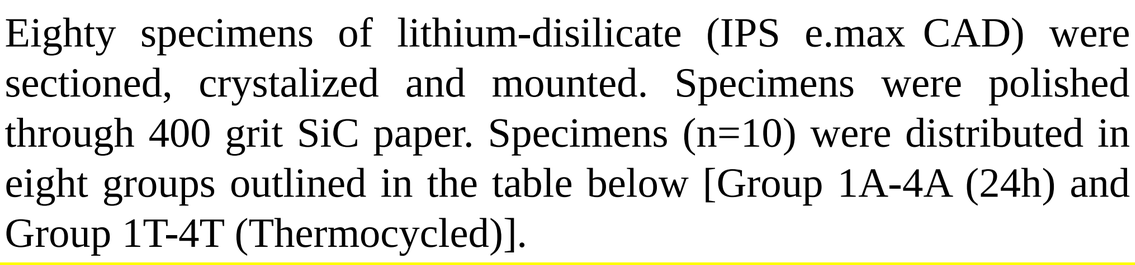
Sectioned — Crystallized — Mounted — Polished

Eighty specimens of lithium-disilicate (IPS e.max CAD) were sectioned, crystalized and mounted. Specimens were polished through 400 grit SiC paper. Specimens (n=10) were distributed in eight groups outlined in the table below [Group 1A-4A (24h) and Group 1T-4T (Thermocycled)].

**Experimental Groups: Stored 24h (A)/Thermocycled (T)**

| | Surface Treatment | | Resin Cement |
|---|---|---|---|
| | Lithium-disilicate | Pre-cured Composite Rod | |
| Groups-1A/1T | Monobond Etch & Prime | Adhese Universal | Variolink Esthetic DC |
| Groups-2A/2T | HF (5%) 20 s | Monobond Plus | |
| Groups-3A/3T | | Scotchbond Universal | RelyX Ultimate |
| Groups-4A/4T | | Optibond XTR | Nexus 3 |

**B) Resin Composite Rod (RCR) Preparation**

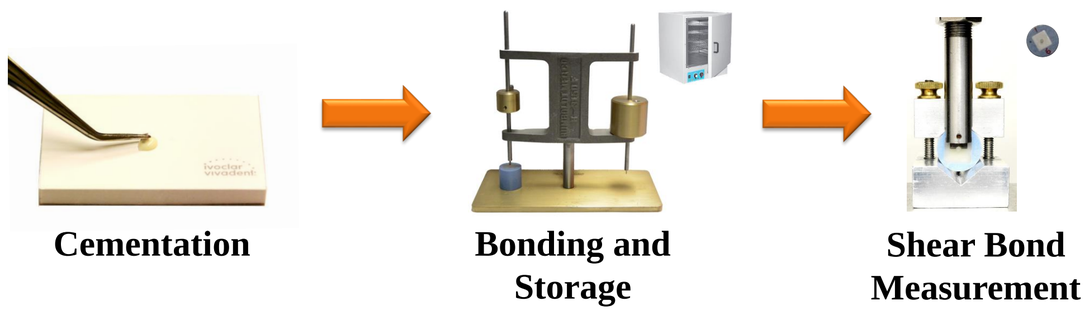


Composite Rods — Sand-blasting — Adhesive application — Light curing

Pre-cured resin composite rods (Diameter - 2.38 mm) were air-abraded (Silica/50µm/15psi), adhesive was applied and light cured (10 seconds).

## MATERIALS AND METHODS, Cont.

**C) Cementation and shear bond measurement**



Cementation — Bonding and Storage — Shear Bond Measurement

The RCR were cemented using adhesive resin cement under constant load (113.4 grams). Specimens were light-cured per manufacturer's instruction followed by storing for 24 hours at 37°C/100% humidity before shear-bond testing using universal testing device (Instron / crosshead speed-1.0 mm/min).

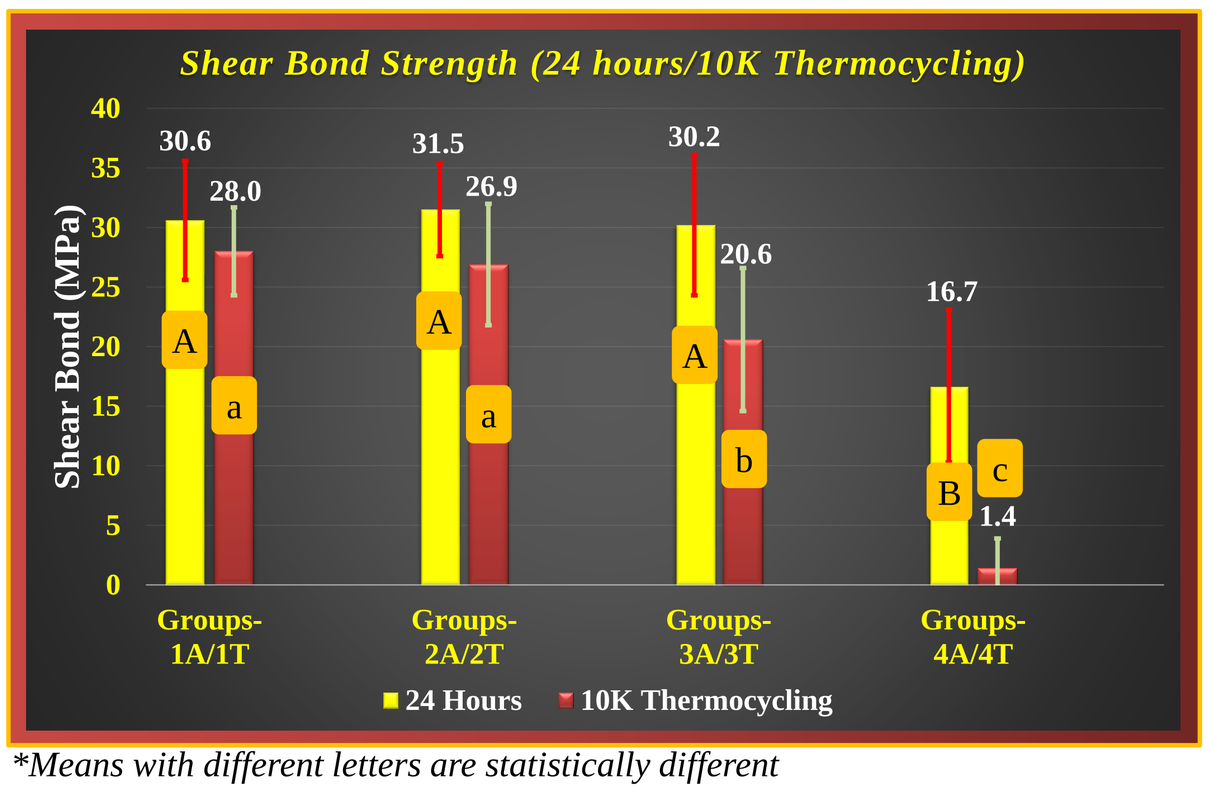
**D) Thermocycling and shear bond measurement**

Thermocycling — Shear Bond Measurement

The other half of the specimens for each treatment group were thermocycled in a SD Mechatronik Chewing Simulator from 5-55°C for 10,000 cycles using 40s dwell time before loading to failure (Instron / crosshead speed-1.0 mm/min).

## RESULTS

Data was analyzed using one-way analysis of variance (ANOVA) and Tukey's post hoc analysis to determine statistical difference (α=0.05) between or within each group.




**Means with different letters are statistically different*

- There was no significant difference in shear bond strength when using a new self-etch ceramic primer compared to Group 2.
- No significant differences in bond strength were found after thermocycling for Groups 1 and 2.
- Mean bond strength of Groups 3 and 4 decreased statistically after thermocycling.
- Group 4 had lower shear bond strengths before and after thermocycling than all other groups.

## DISCUSSION

Within the bounds of this study that the single step etching and priming surface treatment in Group 1 produced similar results to a conventional technique of 5% HF and silane containing primer in Group 2. The use of universal types of adhesives as ceramic priming agents, Groups 3 and 4, appeared to have similar degradation of the bond to the ceramic surface over time to varying degrees in this study.

## CONCLUSION

Within the limitation of this study, for 24 hour storage Groups 1A-3A produced statistically higher bond strengths than 4A. After thermocycling, Groups 3T and 4T produced statistically lower bond strengths than for 24h storage (3A and 4A).