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## Introduction

Dental composites are considered to be the material of choice for anterior teeth's for many years, and due to recent developments it is widely used in posterior teeth's as well. However these restorative materials require complex adhesive procedures for bonding to dentine, Additionally, polymerization shrinkage can damage the bond.

The aim of this study is to produce self adhesive & high strength composites containing lower shrinkage diluent monomer and an adhesion promoting / surface active activator.

## Objectives

Assess how replacement of the activator DMPT by the surface active and methacrylate containing amine SAN, and TEGDMA diluent with higher molecular weight PPGDMA, affects mechanical and "self" adhesive properties of dental composites to dentine conditioned by adhesive (ibond) or acid exposure.

## Materials & Methods

UDMA and TEGDMA (T) or PPGDMA (P) in 3:1 mass ratio were mixed with 5 wt % HEMA, 1 wt % CQ and 1 wt % DMPT (D) or SAN (N) to provide 4 composites designated as TD, TN, PD and PN. These were combined with silane treated glass particles (PLR 4:1). Results were compared with commercial Z250.

The biaxial flexural strength of composite discs (10 mm diameter, 1 mm thick) were determined after 24 hours in distilled water (figure 2 a).

Composite debonding force was determined using a "push out" test, and ivory dentine blocks. Cylindrical holes (3 mm diameter, 5 mm deep) were drilled, acid etched or ibond adhesive applied for 0 or 20 s, and filled by composite (figure 1 c).

For shear bond all dentine surfaces were either acid etched, or applied with ibond adhesive for 0 or 20 s, followed by filling of the brass tubes (3 mm internal diameter, & 6 mm long) with composite pastes (figure 1 d)..

All these tests were performed on Instron Universal testing machine.

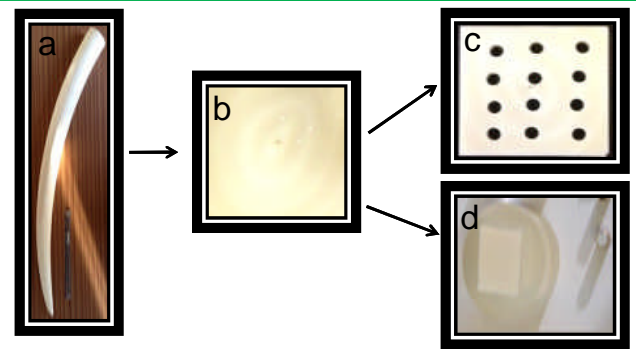


Figure 1: Ivory tusk (a), after cutting into rectangular block (b), holes of 3 mm x 5 mm for push out test were drilled (c), block of dentine was used for attaching brass tubes filled with composite for shear bond test (d)..

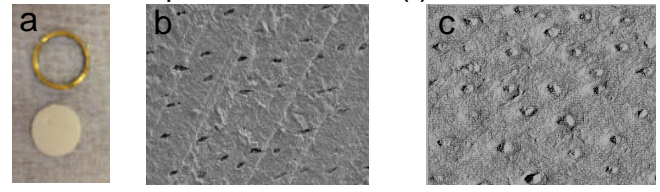


Figure 2: Composite disc along with metal ring for BFS measurement (a), SEM images of Ivory (b), and Human (c) dentinal tubules.

## Results

Average biaxial flexural strength of composites showed no significant difference as shown in figure 3. Both shear stress & debonding force (push out) suggests the significant increase in bonding with adhesive application. The use of acid treatment alone has no significant difference on bonding. Average shear stress & debonding force for TD, TN, PD and PN indicate some improvement with SAN and PPGDMA use (figure 4 & 5).

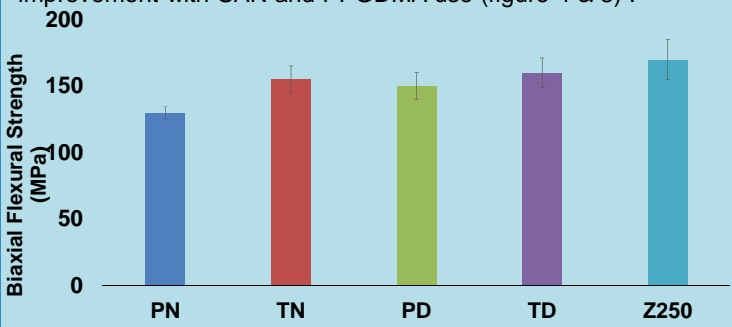


Figure 3: Biaxial Flexural Strength for commercial and experimental composites.

To summarize the results highest bond strengths were observed with ibond use irrespective of other dentine treatments. All experimental materials had greater bonding than Z250 when ibond was used. Under most conditions formulations containing both SAN and PPGDMA gave higher bonding. Demineralizing ahead of ibond adhesive decrease the bonding as compared to ibond only.

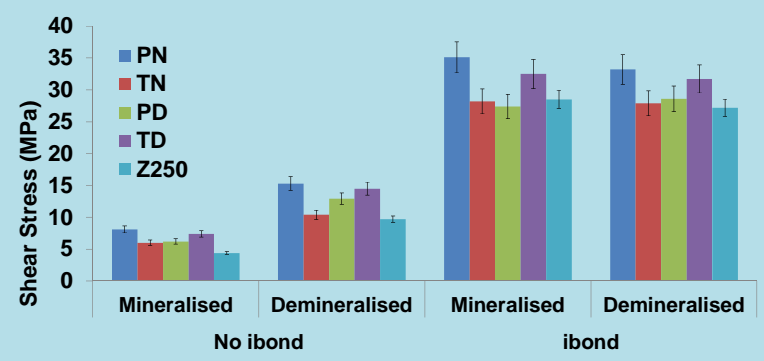


Figure 4: Shear stress for commercial and experimental composites.

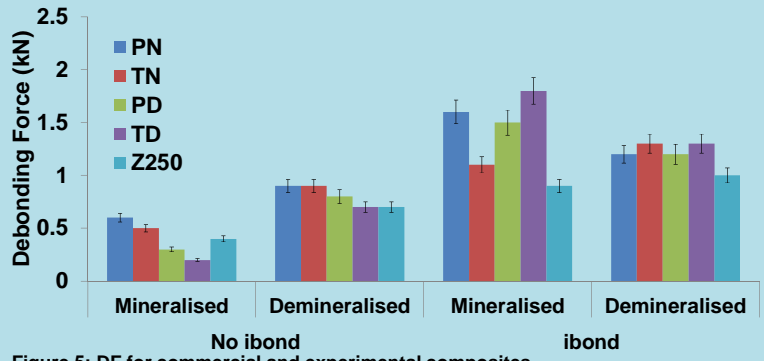


Figure 5: DF for commercial and experimental composites.

## Conclusions

Composite self bonding potential is strongly affected by dentine conditioning. DMPT and TEGDMA replacement by SAN and PPGDMA causes minor reduction in composite strength but can improve dentine bonding.

## Acknowledgments

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