• OIV - 8

A Comparative Study on the Properties of Filler-Added Methacrylate Polymers

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The purpose of this study was to research the properties of some chemically cured methacrylate poly-mers such as MMA, HEMA, TEG-DMA, bis-GMA, GMA.

5 kinds of methacrylates were selected and added 2% tertiary amine and benzoyl peroxide to make a chemically curable polymer. 25 micron crushed silicas which are treated with silane were selected as filler, they were added into methacrylate monomer until the consistency did not changed by the load of 500gram. All of the experimental resins were 5 kinds, and a serial test was done with 3 kinds of items including the filler contents, the tensile strength, and the bond strength. The number of specimen were 10 for each group.

Filler contents were obtained by reducing the specimens to ashes at 600℃ for 1 hour.

The specimens with the dimension of 6mm in diameter and 3mm thick were immersed in 37±1℃ dis-tilled water for 24 hours before test, and tensile strength were measured with cross-head speed 1mm/min. Shear bond strength were measured on the specimens attached to bovine enamel etched with 37% phosphoric acid for 1 minute.

Following results were obtained;

1. Maximum filler incorporation was the highest as 75.5% on MMA, and the least as 53.4% on bis-GMA($p<0.0001$).
2. The tensile stregth were MMA 141.3, GMA 154.3, TEG-DMA 157.4, bis-GMA 161.4 MPa, and HEMA showed the highest value, 226.9MPa($p=0.0004$).
3. The bond strength were GMA 10.1, TEG-DMA 11.7, HEMA 12.2, bis-GMA 13.3 MPa, and MMA showed the highest value, 15.3MPa, however statistical significances were not confirmed ($p=0.3838$).
4. TEG-DMA and HEMA were not different on the aspect of maximum filler contents and shear bond strength($p>0.05$).

These results mean that HEMA can be used as an another diluent substituting TEG-DMA with the increased strength and with the constant bond strength and the constant filler contents.