Effect of Myristyl Trimethyl Ammonium Bromide on the Physicochemical and Biological Properties of an Experimental Adhesive Resin

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OBJECTIVE

This study aimed to evaluate the effect of the addition of myristyl trimethyl ammonium bromide (MYTAB) on the physicochemical and biological properties of an experimental adhesive resin.

MATERIALS AND METHODS

Adhesive formulation

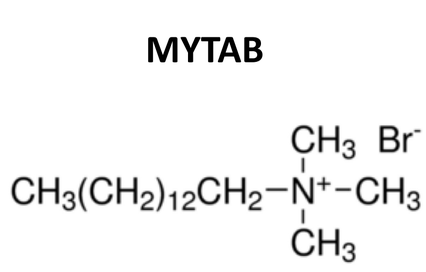
66.6 wt% BisGMA

33.3 wt% HEMA

1 mol% CQ and EDAB

0.01 wt% BHT

MYTAB

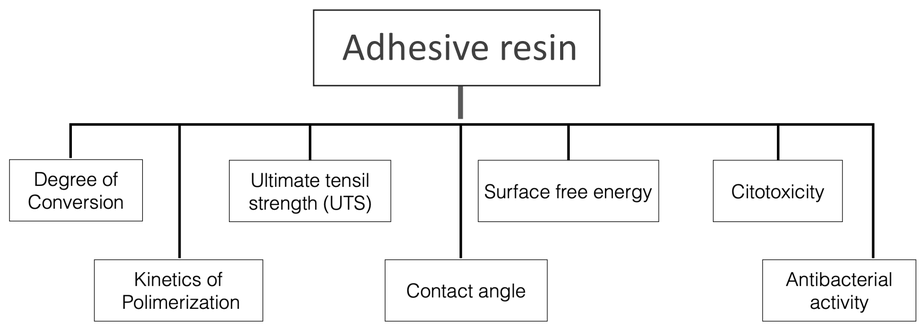


0%

0.5%

1%

2%

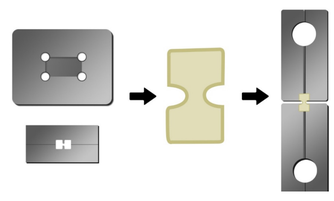


Degree of Conversion/Knetics of Polim.

- FTIR-ATR (Vertex 70, Bruker)
- 40 s of photopolymerization
- Valo (Ultradent)
- n=3
- 2 spectrum/s

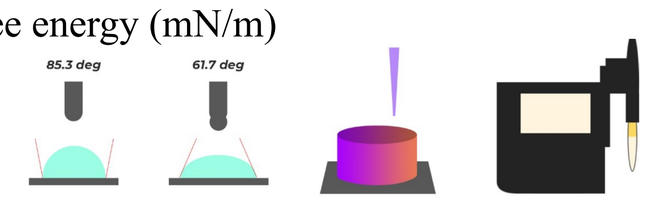
Ultimate Tensile Strength

- Universal testing machine (1mm/min)
- 1 mm^2
- n=5



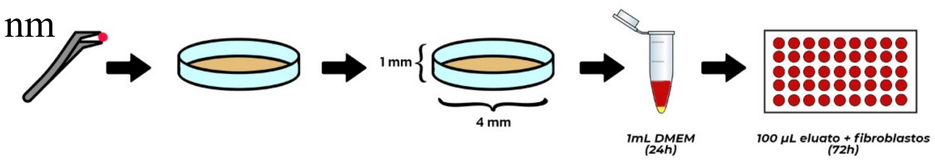
Contact angle and SFE

- Water and bromonaphthalene
- Surface free energy (mN/m)
- 10 s
- n= 5



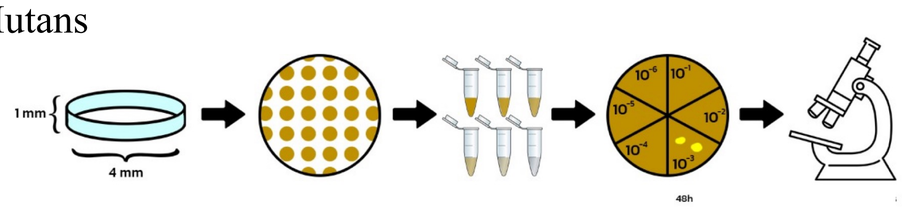
Citotoxicity

- Fibroblasts of human pulp
- Eluate : 24hrs DMEM + samples
- 72 hrs Eluate + Fibroblasts
- Sulforhodamine B
- 560 nm
- n=5



Antimicrobial activity

- Biofilm formation
- Planktonics cells
- Colony-forming units (CFU)
- Streptococcus Mutans
- n=3



RESULTS

Figure 1 Results of polymerization kinetics and degree of conversion analyses. Degree of conversion as a function of time (A). Polymerization rate as a function of time (B). Polymerization rate as a function of the degree of conversion (C) of the experimental adhesive resins.

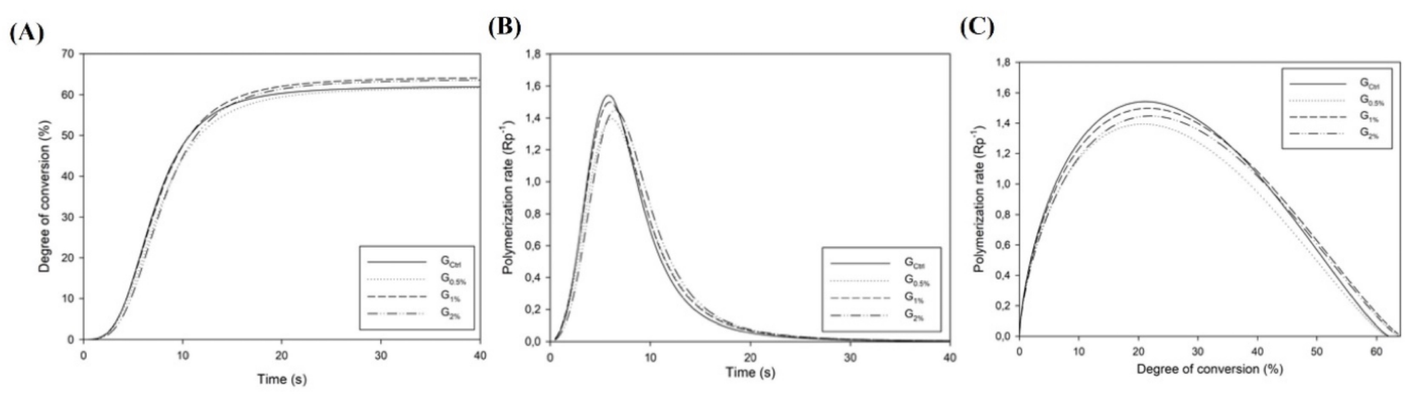


Table 1 Mean and standard deviation values of Degree of Conversion (DC).

Groups	DC (%)
G_{Ctrl}	58.76 (±0.17) ^{AB}
$G_{0.5\%}$	58.18 (±0.62) ^{B}
$G_{1\%}$	60.38 (±1.43) ^{A}
$G_{2\%}$	59.86 (±0.49) ^{AB}

Different capital letters indicate statistically significance diference between groups (p<0.05)

Table 2 Mean and standard deviation values of Ultimate Tensile Strength (UTS).

Groups	UTS (MPa)
G_{Ctrl}	64.64 (±5.29) ^{A}
$G_{0.5\%}$	63.97 (±18.41) ^{A}
$G_{1\%}$	60.92 (±13.72) ^{A}
$G_{2\%}$	71.47 (±15.70) ^{A}

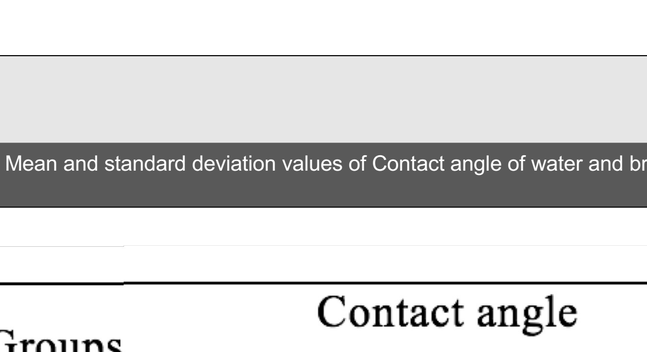
Different capital letters indicate statistically significance diference between groups (p<0.05)

Table 3 Mean and standard deviation values of Contact angle of water and bromonaphtalene, and Surface Free Energy (SFE).

Groups	Contact angle		SFE (mN/M)
	Water	α-bromo	
G_{Ctrl}	74.67 (±4.47) ^{A}	24.73 (±5.45) ^{B}	45.71 (±2.83) ^{A}
$G_{0.5\%}$	72.37 (±1.78) ^{A}	30.69 (±4.86) ^{B}	45.06 (±1.23) ^{A}
$G_{1\%}$	71.03 (±3.91) ^{A}	29.97 (±4.52) ^{B}	45.60 (±0.86) ^{A}
$G_{2\%}$	73.78 (±3.70) ^{A}	37.96 (±6.14) ^{A}	42.44 (±3.00) ^{A}

Different capital letters indicate statistically significance diference between groups (p<0.05)

Figure 2 Mean and standard deviation values of cell viability (human pulp fibroblasts), by SRB.



Different capital letters indicate statistically significance diference between groups (p<0.05)

Table 4 Mean and standard deviation values of cell viability (human pulp fibroblasts), by SRB.

Groups	Antibacterial activity	
	Biofilm formation (log CFU/mL)	Planktonic bacteria (log CFU/mL)
G_{Ctrl}	7.14 (±0.18) ^{A}	8.27 (±0.10) ^{A}
$G_{0.5\%}$	6.11 (±0.11) ^{B}	7.80 (±0.04) ^{B}
$G_{1\%}$	5.59 (±0.26) ^{C}	6.77 (±0.07) ^{C}
$G_{2\%}$	5.02 (±0.11) ^{D}	5.73 (±0.14) ^{D}
$G_{negative}$	-	8.30 (±0.07) ^{A}

Different capital letters indicate statistically significance diference between groups (p<0.05)

CONCLUSION

The addition of 0.5% of MYTAB induced antibacterial activity for the adhesive without affecting physicochemical and biological properties.