

# **Laboratory Properties and Clinical Performance of Three Different Fluoride Releasing Restorative Materials**

Thesis

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# *Dedicated to*

## *My Son*

*Who his smile is the sunlight and joy that gave me  
the energy to continue my work.*

## *My Husband*

*Who without his help, understanding, love and  
continuous endless support, I wouldn't have been  
standing here today!*

## *My Mother*

*Who always inspires me with her love and prayers.*

## *My Father*

*Who taught me that dedication and hard work are  
the essentials for a successful life.*

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## List of Abbreviations

ADA	Americam Dental Association
ANOVA	Analysis of Variance
APF	Acidulated Phosphofluoride
BisGMA	Bisphenol glycol methacrylate
DC%	Degree of conversion
FTIR	Fourier transform infra-red
GIC	Glass ionomer cement
g	grams
HEMA	hydroxyethyl methacrylate
KBr	Potassium Bromide
LED	Light emitting diode
mm	milli-meter
min	minutes
ml	milliliter
MIR	Middle infra-red
MPa	Mega Pascal
NAF	Sodium Fluoride
PAM-CR	Polyacid-modified composite resin
p.p.m	Part per million
PEGMA	Polyethylene glycol dimethacrylate
RCT	Randomized Controlled Study
R.P.M	Rotation per minute
SEM	Scanning electron microscope
SiC	Silicon Carbide
SD	Standard Deviation
SPSS	Statistical Package for Social Science
s	Seconds
TEGMA	Triethylene glycol dimethacrylate
USPHS	United States Public Health Services
UDMA	Urethane dimethacrylate
WV	Weight by volume
WT%	Weight perecent
YbF3	Yettribium Trifluoride
°C	Degree centigrade
μL	Micro-Litre
k	Kappa

# **Introduction**

## Introduction

The restoration of carious primary teeth plays an underestimated role in pediatric dentistry. This is quite astonishing for many reasons, one of which is that there are many new materials introduced to the market in the recent years <sup>(1)</sup> and yet there is minimal data in literature discussing their performance <sup>(2)</sup>.

Many tooth-colored restorative materials such as; high viscous glass ionomer cement, resin-modified glass ionomer cement, resin composite, and polyacid-modified composite resin are available as filling materials for carious primary teeth <sup>(3)</sup>.

Fillings for primary teeth require some requisites such as; being less technique sensitive, ease of application, fluoride release, biocompatibility, and patient acceptance.

Polyacid-modified composite resins, known primarily as compomers, were introduced in the early 1990s<sup>(4)</sup>. They are a group of aesthetic materials used for restoring decayed primary teeth <sup>(2)</sup>. They were introduced in the market as a new class of dental material designed to combine the esthetics of the traditional resin composite material with the fluoride release of glass-ionomer cements. The name “compomer” is derived from the two ‘parent’ materials, the ‘comp’ coming from composite, and ‘omer’ from ionomer <sup>(5)</sup>.

Polyacid-modified composite resins (PAM-CRs) are more closely related to resin composites. They offer excellent esthetics and show intermediate wear characteristics and shrinkage <sup>(6)</sup>. The initial setting of the material is achieved by light curing and only a limited

acid/ base reaction occurs. Ion exchange adhesion never occurs, as in conventional glass ionomers, in fact they still release little amounts of fluoride <sup>(7, 8)</sup>.

Clinical studies have shown that PAM-CRs perform well in different applications. They are used as a filling material for Class I,II and V in primary teeth. They are also used as fissure sealants and as cement for fixing orthodontic bands <sup>(9)</sup>.

Based on high clinical success rates, PAM-CRs are now considered an effective alternative to other materials for restorative therapy in anterior and posterior primary teeth. A minimum amount of compliance is still mandatory in order to allow for a few minutes of adhesive pretreatment and layering without contamination <sup>(1)</sup>.

New and modified forms of PAM-CRs for restoring primary teeth have been introduced in the market. These modifications target several aspects, among which is the clinical aspect. Such material comes in a flowable form having a low modulus of elasticity, low surface tension accordingly more wettability, better bonding and increased flexibility to dissipate the stresses resulting from polymerization shrinkage <sup>(10)</sup>.

The use of flowable forms of filling materials seem to be more convenient with children as they offer ease of application, shorter duration for insertion, and serve to lessen the chances of poor adaptation, voids and secondary caries formation <sup>(11)</sup>.

From the psychological aspect, the PAM-CR material comes in different colors motivating the parent and child towards the filling