



A Quantum Leap Elastomeric Material- Vinyl Polysiloxane Ether

Dr. Neelarapu Sanjana Supriya¹, Dr. Sujesh M², Dr. C. Ravi Kumar³, Dr. Rajanikanth A.V⁴, Dr. G. Harilal⁵, Dr. Ch. Kavitha⁶

¹Post Graduate, Department of Prosthodontics and Crown and Bridge, Mamata Dental College and Hospital, Khammam, Telangana, India

²Professor, Department of Prosthodontics and Crown and Bridge, Mamata Dental College and Hospital, Khammam, Telangana, India (Corresponding Author)

³Professor and Head, Department of Prosthodontics and Crown and Bridge, Mamata Dental College and Hospital, Khammam, Telangana, India

⁴Professor, Department of Prosthodontics and Crown and Bridge, Mamata Dental College and Hospital, Khammam, Telangana, India

⁵Reader, Department of Prosthodontics and Crown and Bridge, Mamata Dental College and Hospital, Khammam, Telangana, India

⁶Senior Lecturer, Department of Prosthodontics and Crown and Bridge, Mamata Dental College and Hospital, Khammam, Telangana, India

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ABSTRACT:

The success of restoration fabrication is strongly reliant on an accurate impression from which an exact reproduction of the intraoral structures may be made. Elastomeric impression materials have long been the preferred material in fixed prosthodontics due to their intrinsic features, including decreased marginal voids and distortion, resulting in higher gypsum dies quality. The most often utilised elastomeric materials are vinyl polysiloxanes (VPS) and polyethers (PEs). Developments in elastomeric chemistry have given rise to a new generation of impression materials: vinyl siloxane ether, a hybrid of a polyvinyl and a polyether impression substance. The objective of this article is to review this new impression materials composition, characteristics, and clinical usage.

Introduction

Making an impression is a critical stage in the manufacturing of a definitive prosthesis that involves the precise transfer of the patient's soft and hard tissues to the laboratory. An ideal impression material must have good dimensional accuracy, surface detail replication, and mechanical attributes like tear strength, tensile strength, and elastic recovery. These qualities enable them to survive the strains of various therapeutic problems as well as to reduce voids, bubbles, and rips.¹ Various elements impact impressions' accuracy, including impression method, type of impression tray, impression material qualities, operators' experience and expertise, periodontal state, gingival health and soft tissue care, moisture control, and preparation of finish line position.¹ In addition, the variables such as salivation, blood flow, and sulcular

fluid, recording mouth cavity tissues is challenging. This is especially important when documenting completion lines for fixed restorations with intracellular borders. As a result, the majority of dental surveys properly rank hydrophilicity as the most significant criterion for selecting an impression material.² Elastomers are a class of rubbery polymers that are cross-linked chemically or mechanically. Polysulfide, condensation polysilicone (CPS), addition polysilicone (APS), and polyether (PE) are four varieties of elastomers used as impression materials. The most prevalent elastomeric impression materials are addition silicone and polyether. The earlier addition polysilicones were hydrophobic, rendering impression accuracy uncertain. Surfactants have been added to the newer version of APS to provide hydrophilicity. Polyether, on the other hand, is hydrophilic and records fine detail; however, it is the



stiffest of all elastomers.² A novel impression material, defined by the producer as a vinyl siloxanether (VSE), has recently been commercially accessible. Thomas stober³ stated that this material has good mechanical and flow qualities and excellent wetting characteristics in both the unset and set. Conditions when applied to a prepared tooth. Improving hydrophilicity can result in increased. Flow and finer detail of impressions created on wet dentinal surfaces and in the gingival sulcus region. With the unique and unusual composition, the accuracy of the new vinyl siloxanether has not yet been confirmed.³

History

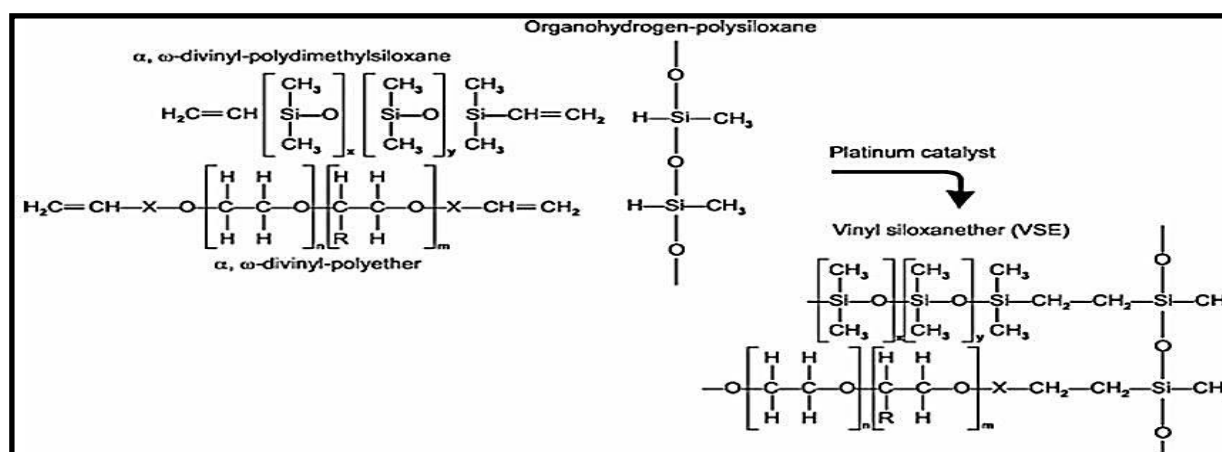
Polysulfides and condensation reaction silicones (C-type silicones) were employed consistently in fixed prosthodontics in the 1950s. In the late 1960s, polyether, a hydrophilic product cured by the cationic ring-opening polymerization process, was brought to the market. Its exceptional mechanical qualities, good

elastic recovery, and low shrinkage make it preferable to hydrocolloids and C-type materials. Fifteen years later, hydrophobic addition-cured silicones (PVS) were developed. Surfactants were used to reduce the amount of hydrophobicity. PVS has excellent dimensional stability across time and temperature. Even under wet conditions, it is well-known for its remarkable elastic recovery.² The preceding 20 years have brought significant growth in polyether and (PVS) categories, and they currently appear to be the most acceptable product categories for most prosthodontic uses. Christensen remarked in 1997⁴ that three types of impression materials dominated fixed, removable, and implants prosthodontic applications: addition reaction silicone, polyether, and reversible hydrocolloid. Vinyl polysiloxane and polyether elastomers are combined to form a new chemical compound called "polyvinyl siloxane ether for predictable accuracy and high-quality impressions.

Table 1: Compositions of vinylpolysiloxanes polyether⁵

Vinyl Poly Siloxane	Polyether
<p>Base Paste Polymethyl Hydesiloxane, Other Siloxane Prepolymers, Fillers- Colloidal Silica Accelerator Di Vinyl Polysiloxane Platinum Salt, Palladium, Retarders, Fillers</p>	<p>Base Paste Polyether, Prepolymer Filler- Colloidal Silica, Plasticizer-Glycol Ether Or Phthalate Accelerator Alkyl Aromatic Sulfonate, Fillers-Silica Plasticizers-Phthalate</p>

Figure 1: Chemistry



The chemical compounds divinyl polymethylsiloxane and divinyl polyether combines with organohydrogen polysiloxane in the presence of catalyst platinum salt form a cross-linking between them and to form new

compound vinyl siloxane ether (Fig 1). It does not give any byproduct.



Properties

This material should only be used in a one-step multiple-mix process. It is available in medium (monophase), heavy, and low viscosities. Some firms also provide standard and rapid setting materials, with putty viscosity available in the standard setting substance.² EXA'lence is made out of PVS and PE and is marketed as a hydrophilic substance that, supposedly, keeps the parent goods stable. The material's chemistry is novel, allowing it to be innately hydrophilic without the requirement for built-in surfactants seen in typical PVS materials. According to the manufacturer, the material has excellent tear strength, increased flexibility, and minimal accuracy.⁵ Shetan et al.⁶ investigated the wettability, dimensional changes, flexibility, and tear resistance (TR) of nanofiller- containing PVES and VPS impression materials to standard VPS and PE impression materials. They discovered that all materials were hydrophilic, particularly PVES and PE, which had the maximum wettability. Wadhvani et al.⁷ stated that VSE monophase impressions and VSE dual-viscosity impressions had appropriate accuracy for clinical application with immersion disinfection since the findings for VSE were equivalent to the results for typical PE and VPS material. Lamia Singer et al.⁸ studied how polyether's dimensional accuracy was enhanced by hybridization with addition silicon, resulting in lower values of vinylpolyether silicone hybrids dimensional alterations when compared to polyether. Before and after setting, the hybrid material demonstrated improved hydrophilicity and decreased contact angles. In wet circumstances, the vinyl polyethersilicone hybrid elastomeric impression material reproduced detail equivalent to polyether and better than addition silicon elastomeric impression materials. Moreover, the surface's dryness and wetness have a significant influence on the detail reproduction of the various examined materials. Bikash Pattanaik⁹ compared the effect of one step and two step impression technique on accuracy when finish line is within the sulcular area by using PVS and VSE. It was stated that impression technique does not affect the dimensional accuracy of impression material. The properties of VSE impression materials are given in Table 2.

Table 2: Physical Properties of Vinyl Polysiloxane Ether

Working Time (35°C)	1 min 20 sec
Intraoral Setting Time (35°C)	3 min 30 sec
Total Setting Time	5 min 30 sec
Hardness (Shore)	A6
Linear Dimensional Change	-0.2%

Recovery form Deformation	>99%
Strain-in-Compression	2.3%

Manipulation²

The multiple mix approach entails making a custom tray and filling it with two viscosities of materials to record the tissues. In the case of the heavy-light body combination, the assistant dispenses the heavy body into the impression tray with a dynamic mixer while the operator injects the light viscosity onto the tooth of interest. The tray with the heavy body is inserted in the mouth and then withdrawn to obtain the impression.² In the instance of monophase viscosity, the identical substance is put onto the tray and a special syringe with a plunger provided by the manufacturer is used. Because of shear thinning and a unique thermo-sensitive rheology system, the syringe material precisely flows onto the prepared teeth when extruded from the syringe. The tray with tray viscosity monophase is then put in the mouth, and the imprint is completed. VSE impression material is indicated for making Implant impressions, Veneers, Precision impressions, Crown and bridge impressions, and Inlay/onlays.²

Advantages²

- Elastomeric characteristics have been optimized, resulting in dimensionally precise recovery and effortless removal from the mouth.
- It is odourless and tasteless, providing it a pleasing mouth feel. This assures that the patient has no gag reflex or irregular movement.
- Excellent hydrophilicity (dynamic surface conditioning via a synergistic hydrophilic system) guarantees excellent wetting in a moist environment and the lowest contact angle feasible.¹⁰
- High flowability owing to a thermosensitive rheology system allows the material to enter the smallest sulcus fissures while maintaining excellent stability.¹¹
- Product characteristics remain consistent during the clinical working time.

Conclusion

VSE monophase impressions and VSE dual- viscosity impressions proved adequate accuracy for clinical application with immersion disinfection. This material is recommended for cases with undercut sections because it allows for the removal of imprints without tearing or distortion.



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