

CHAPTER 2
LITERATURE REVIEW

2.1 DENTURE BASE POLYMERS

Polymeric denture base materials are classified into five types according to ISO 1567:1997 (Table. 2.1). Types 1 and 2 are the most widely used products.

Table 2.1 Classification of denture base polymers according to ISO 1567: 1999

Type	Class	Description
1	1	Heat-polymerized polymer, powder and liquid
1	2	Heat-polymerized (plastic cake)
2	1	Auto-polymerized polymers, powder and liquid
2	1	Auto-polymerized polymers (powder and liquid pour type resin)
3	-	Thermoplastic blank or powder
4	-	Light-activated materials
5	-	Microwave-cured materials

2.1.1 Conventional heat-polymerized PMMA

Conventional heat-polymerized PMMA is supplied as a powder and liquid. The powder contains a copolymer of PMMA in the form of spheres or beads to which the benzoyl peroxide initiator is added. Coloring pigments and fibers often are added for improved esthetics. The liquid is methyl methacrylate (MMA) monomer with a cross-linking agent usually ethylene glycol dimethacrylate to provide craze resistance (Hill, 1981). A small amount of inhibitor (hydroquinone) is added to avoid premature polymerization and enhance shelf life.

MMA is a flammable liquid of low viscosity, like water. It is extremely volatile and boils at approximately 100° C (Combe, 1992). Harrison and Huggett (1992) has demonstrated that the curing cycle of 7 hours at 70°C plus 1 hour at 100°C produced polymer with better mechanical properties compared to other curing cycles. A correctly

heat-polymerized denture base could have as little as 0.54 % to 1.08 % residual MMA monomer.

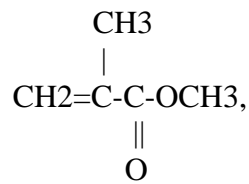


Fig. 2.1. The chemical structure of methyl methacrylate (MMA).

2.1.2 Auto-polymerized PMMA

Chemical activators may also be used to induce denture base polymerization. This type of activation does not require the application of thermal energy and therefore are often referred to as cold-curing, self-curing or auto-polymerized resins. Auto-polymerized resin has a widespread use in dental field, especially in prosthodontics for denture repair, denture duplication, denture relining and occlusal modification of dentures (Devlin, 1986). The composition of this material is the same as the heat-polymerized version, except that:

- i) the powder contains beads of polymer that have a lower molecular weight than those of the heat-polymerized material
- ii) the liquid contains a chemical activator to start the activation.

Denture bases made from these resins are processed quickly at room temperature. Generally, the degree of polymerization achieved using auto-polymerized resins is not as complete as that achieved using heat-polymerized resins. They have more unreacted residual monomer which serves as a potential tissue irritant thereby compromising the biocompatibility of the denture base. The residual monomer also acts as a plasticizer, which results in decreased transverse strength of the denture resin. Auto-polymerized resins display slightly less shrinkage than heat-polymerized resins

because of less complete polymerization, therefore a lower dimensional change than dentures produced by heat processing (Anusavice, 2003).

2.1.3 Microwave-polymerized polymers

Curing denture base resins with microwave energy was first reported by Nishii in 1968. A conventional microwave oven was used to supply the thermal energy required for polymerization. The resins used with microwave-polymerized polymers have the same composition as those used with the conventional material but a nonmetallic flask is required for denture processing. The advantages of curing denture resin by microwave energy include a greatly reduced curing time, less cumbersome equipment, and a cleaner method of processing (Sanders et al., 1987). Although most of the physical properties of the denture resin cured by microwave energy proved to be as favourable as those resin cured by the conventional heat method, the presence of moderate to severe porosity and an insufficiently cured resin were two problems encountered.

2.1.4 Light-polymerized denture base polymers

Light-activated polymers in dentistry are not new. Over 25 years ago ultraviolet light-activated fissure sealants and composite tooth-filling materials were introduced. The two main components of composite filling materials are the resin phase and the reinforcing filler. The filler is bonded chemically to the matrix by a third minor phase, an interfacial coupling agent. The resin matrix in the majority of composites is typically based on bisphenol A diglycidyl dimethacrylate (Bis-GMA) or urethane dimethacrylate (UDMA) (Virendra, 2004). These are high molecular weight liquid monomers of high viscosity. Blending of filler particles with a material of this consistency is difficult and manufacturers normally have to use a fluid diluent monomer such as triethylene glycol dimethacrylate (TEGDMA) to reduce the viscosity (Mc Cabe, 1998).

UDMA can be described as any monomer chain containing one or more urethane groups and two methacrylate end groups (Fig. 2.1). The advantage with UDMA is its higher flexibility, which increases its likelihood of participating with both methacrylate groups in the polymerization process. Monomers of this type have a relatively low viscosity and do not require the use of a diluent monomer although some manufacturers do blend various monomers together (Mc Cabe 1998).

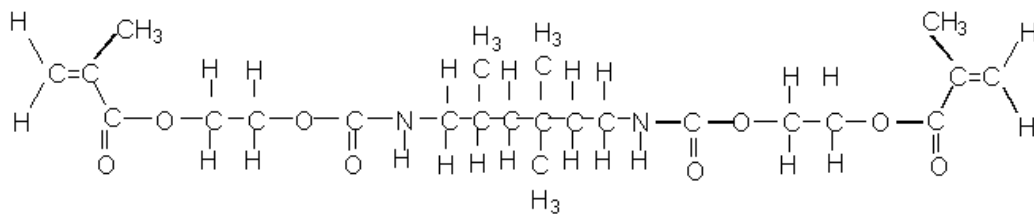


Fig. 2.1. Urethane dimethacrylate (UDMA) chemical structure.

The presence of fillers strengthens the composite resin and reduces its thermal expansion and water sorption. If the fillers occupy a significant proportion of the volume of a composite material it markedly lowers setting contraction (Mc Cabe, 1998). In addition, they affect handling characteristics in controlling the consistency of the composites and may also impart radiopacity (Virendra, 2004). Fillers commonly used include quartz, fused silica and many types of glass including aluminosilicates and borosilicates (Mc Cabe, 1998).

Visible light-polymerized denture base resins were introduced in the early 1980s. Triad is a system developed by Dentsply International Inc. (York, USA) for use in removable prosthodontic and for orthodontic work (Al-Mulla et al., 1988). Unlike restorative materials, Triad material uses organic filler as well (Ogle et al., 1986). The polymerized material consists of a urethane dimethacrylate matrix with acrylic copolymer and microfine amorphous silica filler particles with the silica content of 14 % w/w (Al- Mulla et al., 1988). The organic filler consists of acrylic resin beads of

varying sizes in the range of 2-60 nm that becomes part of an interpenetrating polymer network structure when cured (Ogle et al., 1986). Scanning electron microscopy of a fractured section of the polymerized material demonstrated the composite nature of the material (Al- Mulla et al., 1988).

Light-activated denture base materials are generally supplied as a single paste which contains monomers, co-monomers, filler and an initiator. The initiator is unstable in the presence of light. In early 1970s, ultraviolet light (UV) was used to start polymerization process in composites. However, there were some serious drawbacks with the use UV light-cured systems, such as soft tissue burns and damage to the eye (van Noort, 2002). The current restorative composite resins are activated by visible light in a range of 460-480 nm wavelengths (van Noort, 2002). For visible light-activated composites, the initiator system comprises a mixture of a diketone and an amine. Camphoroquinone is the commonly used diketone which rapidly forms free radicals in the presence of an amine and radiation of the correct wavelength and intensity (McCabe, 1998).

One problem with PMMA denture base polymers is tissue reactions to methyl methacrylate, such as toxic and allergic reactions (Basker et al., 1990, Austin and Basker, 1982, Weaver and Goebel, 1980, Guinta et al., 1979, Fisher, 1956). Therefore one of the advantages of visible light-polymerized denture resins is minimization of the allergen methyl methacrylate. Ogle et al. (1986) examined the biocompatibility of Triad denture base material and reported that the polymerized material was nontoxic, and the unpolymerized material appeared to have low toxicity. Alsawaf et al. (1991) evaluated the use of this light-polymerized material in maxillofacial prosthetics and neuro-orthopedic surgery and the result showed that the resin underwent polymerization

without substantial exothermic reaction and the biologic testing indicated that they are non-toxic and biocompatible.

Tanoue et al. (2005) described the use of a light-polymerized composite denture base for a patient hypersensitive to PMMA, polysulfone, and polycarbonate. A urethane-dimethacrylate composite (Axis; GC Corp, Tokyo, Japan) was used as an alternative to fabricate the denture base and the custom artificial teeth (Newmetacolor Infis; Sun Medical Co Ltd, Moriyama, Japan). They reported that the allergic symptoms disappeared from the patient's mucous membrane immediately after placing the new prosthesis and without recurrence of the hypersensitivity after two and a half years.

However, Khan et al. (1987) found Triad VLC material to have greater staining characteristics than heat-polymerized acrylic resin. Triad VLC resin also formed voids on the tissue side upon adaptation (Tan et al., 1988). Al- Mulla et al. (1988) reported that Triad was found to be harder and more rigid than conventional acrylic denture base materials, but the application has been limited because of their brittleness and low impact resistance.

Eclipse Prosthetic Resin System is the latest addition to visible light-activated denture base polymers (Dentsply Int. York, USA). Eclipse resin is also based on urethane dimethacrylate and polymerization is initiated by both heat and light. However, it is claimed by the manufacturer that Eclipse resin has better strength properties compared to Triad resin. A different initiator system was used for Eclipse resin.

Sun et al. (2003) studied the mechanical properties of Eclipse and other PMMA denture base resins and found that Eclipse resin to have superior mechanical properties and recommended its use for denture construction. Ali et al. (2008) compared the flexural strength, flexural modulus and hardness of Eclipse resin to a heat-polymerized

and an auto-polymerized PMMA denture base polymer and showed that Eclipse material exhibited significantly higher flexural strength. Defay et al. (2006) evaluated the transverse strength of Eclipse resin and made comparison with another conventional PMMA and visible light UDMA (Triad). They reported that Eclipse had the highest transverse strength among the materials tested.

Eclipse resin system is comprised of three resins to form the denture and they are supplied in different packages: Baseplate, Set-up and Contour resin. The resins were developed to handle like wax, but without investing and flasking like the conventional compression molding technique in denture construction. The material is packaged in opaque plastic envelopes to prevent contamination by light. The polymerization process is activated by placing the premixed, moldable resin on the master cast on a rotating table, in a light chamber and exposing it to high intensity visible light of 400 to 500 nanometer (nm) wavelength spectrum, for an appropriate period of 10 minutes. High-intensity light results in deep polymerisation of the material to a depth of 5 to 6 mm. In this technique, after an initial cure of the base plate resin, the teeth are repositioned on the base plate using a light-cured template, and contouring is carried out, followed by a final cure in the light chamber. The resin is coated with a non-reactive barrier compound to prevent oxygen inhibition of the surface layer polymerization. The polymerized material contains high molecular weight oligomers, which results in smaller polymerization shrinkage. According to the manufacturer, polymerization shrinkage of the Eclipse prosthetic resin system is 3% compared to 7% in conventional denture base resins.

Grossmann and Savion, (2005) described the use of the Eclipse light-polymerizing resin-based material for the fabrication of a definitive obturator for postmaxillectomy patients. They suggested that the technique described could overcome some of the problems associated with the conventional techniques of definitive

obturator fabrication. The use of processed record bases for the edentulous postmaxillectomy patients was claimed to improve the reliability of maxillomandibular relationship record. Unlike trial record bases, which are constructed after undercuts are blocked out on the definitive cast, processed bases engaged tissue undercuts within the surgical defect, resulting in improved support, retention and stability. This initial stability improved esthetic outcome because it facilitated better evaluation of lip support, plane of occlusion, incisal edge position and tooth arrangement.

The manufacturer of Eclipse claimed that Eclipse denture base is also relinable and repairable like conventional denture base materials. Eclipse dentures can be relined at chairside or in the laboratory. Relines can be performed using the same Eclipse base plate resin, or any other conventional self-polymerized or heat-polymerized reline materials. However, only Eclipse base plate resin can be used to reline and repair an Eclipse denture, because the temperature required to cure Eclipse materials is too high (129 °C) for conventional PMMA denture base polymers.

2.2 RELINING

Relining is defined as the procedure used to resurface the tissue side of a denture, thus producing an accurate foundation of the denture bearing area (The Glossary of Prosthodontic terms, 2005). Dentures loose their fit after a period of time because of the change in topography and structure of the residual ridges (Bowman & Javid, 1977). Therefore removable prostheses often require denture base reline to improve fit and stability. The primary reason for relining is to regain optimal adaptation of the denture base to residual ridges and to achieve a more equal distribution of the load.

One of the advantages of relining is that the fit of dentures was improved after reline (Barco et al., 1979). Tallgren et al. (1992) did a longitudinal electromyographic study of chewing patterns in complete denture wearers and found that there was a

significant increase in chewing force of the temporal muscles and improved chewing patterns after the dentures were relined. Garret et al. (1996) studied the effects of improvements of poorly fitting dentures and new dentures on patient satisfaction. In this study, the dentures of 21 patients were modified to improve occlusion, vertical dimension of occlusion, retention and stability by relining or the dentures were replaced with new dentures. The result demonstrated that patients benefit from relining of poorly fitting dentures or replacement of new dentures with improvements in chewing function.

2.2.1 Relining Procedure

A denture may be relined directly at the chairside in the dental clinic or as a laboratory procedure. Chairside relining involves the direct application of auto-polymerized resin materials to the prepared denture base and the material is allowed to polymerize in the mouth. This technique is not only a convenient method compared to a laboratory-processed reline system, but also reproduces the morphologic features of oral soft tissue directly on the denture base (Haywood et al., 2003). The major criticisms of the chairside reline technique have been the presence of porosities and the lack of colour stability (Steward et al, 1992). Conversely, the simplicity and cost-effectiveness of the chairside reline technique popularized its use, as at least a temporary measure to achieve the goal of regaining the fit of the denture base (Wyatt et al., 1986).

For the laboratory relining, the impression of the soft tissues is obtained using the existing denture as an impression tray. The denture is then invested in a flask or a reline jig and the processing is made by resurfacing the tissue surface of the denture base with a new material. These procedures involve clinical and laboratory phases and require more time. During this time the patient needs to stay without the denture. In addition, any distortion during the packing or processing error may alter the original occlusion.

2.2.2 Denture relining materials

Relining may be accomplished using heat, light or microwaved-activated resins but, in all these instances, significant heat may be generated and distortion of the existing denture base is likely (Anusavice, 2003). Therefore, an auto-polymerized resin usually is chosen for relining. Denture relining materials can be classified into three groups (McCabe and Walls, 1998). They are soft lining materials, tissue conditioners and hard relining materials.

2.2.2.1 Soft lining materials and tissue conditioners

The purpose of a soft liner is to absorb some of the energy produced by masticatory impact and act as a 'shock absorber'. Some patients suffer from chronic pain, soreness or discomfort due to prolonged contact between the rigid denture base materials and the underlying tissues; usually in patients with sharp, thin, or heavily resorbed ridges or those with severe undercuts. Materials available as soft lining materials include plasticized acrylics, silicone rubber, plasticized vinyl polymers and copolymers, hydrophilic polymers, polyphosphazene fluoropolymers, fluoroethylene and polyvinyl siloxane addition silicones. The most commonly used soft liners are plasticized acrylics and silicone rubber which are heat- or chemically-activated (Zarb, Bolender, 2004).

The tissue conditioners or short term soft liners are commonly used as temporary liners for treatment and conditioning of ill-fitting dentures, for provisional or diagnostic purposes, temporary relining of immediate dentures or immediate surgical splints, relining cleft palate speech aids, tissue conditioning during implant healing and for functional impression materials. The liquid of short term soft liner materials contains a mixture of ethyl alcohol (solvent) and an aromatic ester (dibutyl phthalate) which acts as a plasticizer that lowers the glass transition temperature (T_g) of the polymer rendering it a soft gel. The set gel has viscoelastic and elastic properties that allow it to

act as a shock absorber. However, the alcohol and plasticizer leach out quickly, and therefore, the material hardens within a considerably short time, which varies from a few days to a week or two, and gradually loses its cushioning effect. Ideally a tissue conditioner should be replaced with a fresh mix every 2 to 3 days.

2.2.2.2 Hard reline materials

Relining with hard reline material can be performed using direct or indirect method. The direct relining of the denture bases in the mouth can be carried out with auto-polymerizing acrylic resins. The indirect procedure involves clinical and laboratory phases and requires more time.

The conventional auto-polymerized reline material, which mainly contain methyl methacrylate (MMA) monomer, have a problem of unpleasant odour, taste and irritation to oral mucosa because of the monomer or heating during polymerization. Although these reline materials set rapidly, the high polymerization temperatures may cause discomfort to the patients during relining (Bunch et al., 1987; Wyatt et al., 1986). These problems have been solved since cross-linked reline materials which do not contain methyl methacrylate (MMA), became commercially available.

Cross-linking agents has been incorporated into linear polymers to improve stiffness, surface hardness, resistance to temperature and resistance to solvent attack (Price, 1986). Certain properties of cross-linked reline materials, such as colour stability, water sorption, internal porosity, temperature increase during polymerization, and transverse strength, have been investigated (Arima et al., 1995; Takahashi et al., 1997). Arima et al. (1995) showed that highly cross-linked reline resins had higher transverse strength and lower water sorption than the other reline resins tested. These reline materials have less unpleasant odour, easy to manipulate, and generate low exothermic heat during polymerization (Arima et al., 1996). Kooliner resin which is

based on polyethyl methacrylate has been reported to show the lowest peak polymerization temperature than the other auto-polymerized reline resin tested, thus being the more favourable intraoral denture base relining material (Murphy et al., 1986; Wyatt et al., 1986 ; Bunch et al., 1987 and Arima et al., 1996a).

On the other hand, the monomers of the cross-linked reline materials are difficult to polymerize, especially on the surface when compared to MMA. The unpolymerized layer remained because free-radical polymerization reactions can be inhibited by the presence of oxygen (Craig, 1996). Yatabe et al., 1999 studied certain properties of the resulting unpolymerized surface layer on hard, auto-polymerizing reline resins and found that polymerization was inhibited or retarded by the lower temperature, higher oxygen presence and the lower viscosity, especially on the cross-linked reline resins. The unpolymerized layer was also found to be easily contaminated. Therefore, in clinical application, the reline materials should be kept in the mouth as long as possible to avoid contact with air before polymerization.

Laboratory reline materials are normally supplied in powder and liquid form. The powder of the laboratory reline materials contains methyl methacrylate (MMA), benzoyl peroxide and pigments while the liquid consists of methyl methacrylate, dibutyl phthalate and amine. The polymerization is carried out under pressure at room temperature or at a slightly higher temperature (45°C). Polymerization is completed in 30 to 45 minutes. Even though this method is inexpensive, it is time consuming and the patient is without prostheses during the laboratory procedures.

2.3 BOND STRENGTH

Bond strength is the force per unit area required to break a bonded assembly with failure occurring in or near the adhesive/ adherend interface. Bond strength tests could also be called 'debonding tests'. The purpose of breaking apart a bonded assembly is to

establish a number or value showing how strong this bond was. The strength of a bond is related to the size of bonding area and it is therefore, important to control this area and know its dimensions to be able to calculate the bond strength (Oilo, 1993).

2.3.1 Bond strength of relining materials to denture base materials

One of the main concerns of relining is the bond strength between the reline and denture base material. Adequate bond strength is important to ensure retention of the reline polymer on the surface of the denture base so as to maintain the function of the reline polymer. A weakened bond between the polymers allows penetration of oral fluids, which can cause staining, bacteria harboring and complete delamination and failure of the lining (Arena et al.,1993). Among the desirable properties of a denture reline material is the possession of an adequate mechanical property to withstand the load of mastication (Ogle et al., 1986, Arima et al., 1995).

Arima et al. (1996) suggested that denture base surface treatment before relining is necessary to promote adhesion between the reline acrylic and the denture base resins. Methods to improve the bond strength by means of mechanical or chemical surface treatment have been described. Mechanical modifications of the denture base include grinding with burs (Jagger et al., 2002), abrading with air born-particle (Curtis et al., 1989, Takahashi & Chai, 2001b) and lasing (Jacobsen et al., 1997) to increase surface area and mechanical retention. Chemical surface treatments could be used to promote the penetration and diffusion of monomer into the heat-polymerized denture base resin to establish an interwoven polymer network. Chemicals which had been investigated were such as chloroform (Shen et al., 1984; Leles et al., 2001), methyl methacrylate (Ward et al., 1992, Vallittu et al., 1994), acetone (Rached et al., 2001) and methylene chloride (Minami et al., 2004).

Most of the relined specimens were found by researchers to exhibit moderately lower flexural strengths than the bulk denture base specimens. The ability of a higher strength reline material to reinforce the denture base was found to be dependent on proper bonding between them (Takahashi et al., 1997). The strength of the relined specimen of a denture base was also found to be dependent on the bulk strength of the denture base polymer and the reline polymer (Chai et al., 1998, Takahashi et al., 2000).

Both the type of denture base polymer and relining material has been shown to affect the bonding properties of relined polymers. Curtis et al. (1989), Arena et al. (1993) and Takahashi & Chai, (2001a) concluded that there was a significant difference in the bond strength between the various types of reline materials and denture base resins. They reported that Triad which was a visible light-polymerized reline resin exhibited the highest bond strength to Triad denture base resin. For this, bonding agent was used during relining. Other reline materials of dissimilar composition displayed less bond strength to Triad denture base.

2.3.2 Bond strength test method

According to the literature, there was no general agreement about a test method to be used for evaluating the bond strength of hard relining materials (Mutluay and Ruyter, 2005). The test of bond strength of relined denture bases has been performed with a transverse loading method, tensile bond tests and shear bond tests.

2.3.2.1 Transverse loading method

Many workers have utilized transverse loading methods to evaluate the bond strength between denture base and reline polymers (Arena et al., 1993, Lewinstein et al., 1995, Cucci et al., 1998). In this testing, a bar-shaped specimen of the denture base polymer is prepared. A certain length of the polymer bar is removed at its midpoint and replaced with a reline polymer. With the specimens supported at its two ends, a compressive load

is applied at the midpoint of the specimen, where the reline polymer is situated. Failure load of the specimens is then presented as the bond strength between the denture reline and base polymers.

Takahashi & Chai, (2001a) questioned the validity of the transverse loading method of testing bond strength. The nature of stress presented at one of the two denture reline-base polymer junctions is unknown. A bar-shaped specimen is subjected to predominantly bending stresses when loaded under such a three-point bending mode. The nature of stress varies according to the location within the bar (Jayatilaka, 1979). For example, the point of the bar immediately below the point of load application probably receives maximum compressive stress, whereas the midpoint on the opposite surface of the specimen bears the maximum tensile stress. The distribution of stress within the specimen is dependent on factors such as the dimensions of the specimens, the span distance between the supports and the elastic modulus of the material (Jayatilaka, 1979). As the elastic modulus of reline and base polymers vary according to the materials tested, the nature of stress presented at the reline-base polymer junction for different combinations of the specimens cannot be easily predicted or standardized. Thus, results of bond strength obtained from the transverse testing method must be interpreted with caution.

2.3.2.2 Tensile bond test

The test was originally proposed by Kemper and Killian (1976) to test the tensile bond strength of composite restorations to tooth structure. Tensile test had also been used in evaluating bond strength of denture base and reline polymers (Bunch et al., 1987, Razavi et al., 1990 and Smith and Powers, 1991). Tensile bond tests use, most frequently, bar- or rod-shaped specimens. A certain length of the polymer bar is removed at its midpoint and replaced with a reline polymer. In a tensile test the bond is broken by a force working at a 90° angle (perpendicular) to the joint surface. According

to Takahashi and Chai, (2001a) unlike the transverse bond test, the tensile method subjects the reline-base polymer junction to a simple tensile load, which allows the result to be easily compared between materials. The main problem is to maintain alignment both during bonding and testing to avoid stress concentrations due to incorrect interfacial geometry (Oilo, 1993). In addition, Fowler et al, (1969) had pointed out that, tensile failure was not caused by tensile force alone, because some shear forces were also developed at the margin of the bonded surface in the tensile test.

2.3.2.3 Shear bond test

The test was originally proposed by Noguchi (1982). In a shear test, the bond was broken by a force working parallel to the test surface (Oilo, 1993). The force is applied using a knife-edged blade placed parallel to the denture base-reline material interface. The retaining force of cements has been evaluated by a shear bond strength measurement for a long time in dentistry, and this is more acceptable to dentists than the tensile bond test. According to Mc Mordie and King, (1989) the forces that the lining material is clinically exposed to are more closely related to shear and tear tests. The main advantage of this method was that the measurement equipment was easier to construct, and there were only minor influences from variations in loading directions. Sample preparation was also easier than that for tensile test measurement (Watanabe and Nakabayashi, 1994). For shear bond tests, cylindrical columns of denture base resins were mounted in auto-polymerized acrylic resin. Takahashi & Chai, (2001a,b) used a teflon tube and Minami et al, (2004) used a brass ring with a known diameter placed on the denture base surface to confine the reline material during relining.

2.3.3 Failure mode

Adhesion can be defined as the force that binds two dissimilar materials together when they are brought into intimate contact. This is distinct from cohesion, which is the attraction between similar atoms or molecules within one substance (van Noort, 2002). A microscopical inspection of the fractured surfaces could indicate the failure mode of an assembly and the weakest link between the two surfaces.

An adhesive failure occurred if there was no trace of any denture base polymer on the denture reline polymer surface or vice versa. Adhesive failure will likely to occur at the denture base-denture reline material interface under relatively low stresses if the reline material is poorly adhered to the denture base. An improvement of the wetting properties or chemical reactions with the denture base is probably necessary to improve the bond strength. Cohesive failure was deemed to have occurred if there are more than 50% traces of denture reline material on the denture base surface or vice versa. It indicates that the bond strength of the assembly exceeds the strength of the denture base or the reline material. Mixed failure is when there are less than 50% traces of denture reline material on the denture base surface or vice versa.

Little is known regarding the bond strength of Eclipse denture material to the available reline materials. To date, no study has documented on the bond strength of Eclipse UDMA light-polymerized denture base polymer to reline materials. It is clinically important to know which reline material can reliably bond to the denture base material, as a weak bond could result in delamination of the two materials and poor mechanical strength of the relined denture (Takahashi et al., 1997). Therefore, it is the purpose of this in-vitro study to evaluate and compare the shear bond strengths of relined UDMA (Eclipse) to PMMA (Meliodent) denture base polymers.