

Dental Composites Analysis Essay

Introduction

Dofka defines a composite as a fusion of filler particles and a hard matrix (2013, p. 22). These fragments consist of minute sand, fiber, or flake molecules encircled by the hard matrix that binds the molecules together. This paper embodies absolute documentation of dental composites, types of composites, their distinctive properties, and the pertinent novel materials.

Body

- [Dental Composites](#)

In the dental realm, dental composites entail a BISGMA acrylic matrix merged with pulverized quartz or glass molecule fillers (Bharti et al. 2012, p. 205). This paste necessitates the addendum of a catalyst to harden the acrylic substance. Ergucua and Turkun (2007, p. 206) point out that the light-cured composites already contain an inherent enzyme that requires an intense beam to capacitate the hardening process. The glass fillers include a silane coupling agent coat that enables a compact union between the fillers and the matrix (Fraunhofer 2010, p. 16). The coupling agents comprise a methacrylic chemical group that copolymerizes with the methacrylate monomers present in the acrylic substance. According to Goldberg (2014, p. 33), dental composites encompass a broad array of dental cement. This cement is also an amalgamation of varied powders and liquids blended. The fluids partially liquefy the powdery specks, thereby, forming a glue-like matrix. Dentists use this amalgam to plaster posts and crowns (Rueggeberg 2011, p. 41).

Apart from dental cement, dental composites also constitute synthetic resins made up of monomers such as HexaneDiolDiMethAcrylate and Urethane DiMethacrylate (*Types of fillings* 2013). The dentistry profession engages these adhesive resins and restorative materials in its quest for versatility, reparability, mercury reduction, tooth removal, and aesthetics. Goldstein outlines that the resins are very prominent as they are inexpensive, insoluble, aesthetic, and oblivious to dehydration (2010, p. 31). They also incorporate silica and dimethylglyoxime to pull off specified physical traits such as flowability among other concentrations (Demarco 2012, p. 89).

- [Types of Composites](#)

The principal objective of the composite application is to capacitate teeth fillings, says Calhoun (2011, p. 19). As Vargas (2008, p. 28) explains, fillings reconstruct the corroded teeth by retouching the decay and establishing that it does not reiterate. Composite procedures entail several stages namely local anesthetics, etchings, polishing, teeth removals, and resin applications. Outlined beneath are the various varieties and categories of composite fillings.

- [Amalgam](#)

Amalgam encompasses a concoction of copper, tin, zinc, silver, and mercury, accounting for 50% of the paste (Dodge 2014). Amalgam is an economical tariff composite enlisted to seal the

posterior teeth such as the molars and premolars. The non-bond plaster can last for more than ten years, assert Cramer, Stansbury, and Bowman (2011, p. 403). Amalgam fillings are extremely stable and can brave tenacious chewing forces. Dentists can start and finalize the entire filling procedure in a single visit. A disadvantage attributed to this medium, however, is that the amalgam color does not correspond to the white hue of your teeth. Additionally, teeth discoloration may ensue if the amalgam fillings used corrode or darken over time (Eliades & Watts 2005, p. 35).

- Composite resins

Composite resins are the subsequent combination of pulverized glass flecks and plastic. Doctors engage them in direct and indirect treatments, analyzes Shenoy (2008, p. 100). Direct fillings are those procedures entailing the use of bright blue radiations to place the resin on the hollow tooth. As regards indirect filling, the orthodontist formulates an impression of the damaged tooth and uses it in the substructure of the mold filling (*Dental health and tooth fillings* 2015). The specialist will then determine the next appointment whereby he/ she will fasten the filler into place. Composite resins are popular for small and large padding of the front teeth as well as the inlays. The resins stay intact for a minimum of five years. One notable advantage of resins is that they match the natural hue of your dental formula and are very strong since the inlays undergo heat curing (Powers & Wataha 2008, p. 57). However, they are more costly than traditional amalgams.

- Cast gold

According to Weng et al., cast gold constitutes an interfusion of gold together with other metals, creating a gold alloy fit for instituting inlays and crown fillings (2012, p. 1556). Many clients opt for the cast gold as the element weathers more than 15 years, depending on personal maintenance and compressive stress. The material, however, is very exorbitant and uneconomical as it sells for more than ten times the cost of amalgam, quote Shalaby and Salz (2007, p. 42).

- Ceramics

The major component of the ceramic substance is porcelain. Ceramic fillings are aesthetic and very resilient and last for more than seven years (Critchlow 2012, p. 45). Unlike cast gold, ceramics consists of tooth-colored fillings, mainly designed to traverse stains and abrasions. Dental specialists use ceramics in patching implants, veneers, orthodontic brackets, crowns, inlays, and on lays (Maserejian et al. 2012, p. 1017). Ceramic restorations, however, are subject to delicate fractures and cracks and, therefore, necessitate tooth reduction. Jin et al. (2013, p. 59) point out that these fillings are overly expensive and cost even more than the cast gold materials.

- Glass ionomer

With reference to Lifeng et al. (2010, p. 2520), glass ionomers entail a synthesis of fluoro aluminosilicate and acrylic substances. Glass ionomer procedures comprise of two techniques namely the traditional filling as well as the resin-modified approach, says Khurana (2014, p. 54). In the traditional setting, the orthodontist sets the element manually, without the use of a beam.

By contrast, the resin-modified technique employs a bright blue ray to append the ionomer material. As Jurczyk (2013, p. 67) declares, the hybrid ionomer is more steady than the traditional filling. These composite glass ionomers are the best solution for the front teeth plasters, necks, roots, baby teeth, and root caries. As regards baby teeth, ionomers work best for children, whose dental formula is still developing (Kleverlaan & Feilzer 2005, p. 1156). The material regularly releases fluoride that deflects recurrent tooth decay. Despite all these benefits, the glass ionomers are contingent on fractures and do not necessarily match the tooth pigment. The survival period of these elements equals five years or more, claims Donly (2005, p. 29).

- **Properties**

The features employed to analyze the suitability of the dental composites in laboratories encompass parameters such as modulus of elasticity, staining, wetting, and abrasive wear (Bergmann & Stumpf 2013, p. 72). Additional factors consist of polymerization contraction, solubility, leakage, color stability, tensile, bond strength, and shear. Analysts also evaluate the thermal coefficient of expansion to confirm the reaction of the composites under different heat environments (Heintze & Rousson 2012, p. 418). Outlined below are the various parameters dentists evaluate when determining the appropriate elements for cavity fillings.

- **Wear**

The wear evaluation process aims at grading the components at hand in conjunction with scrutinizing the fracture mechanism, remarks Vargas (2008, p. 44). The grading analysis entails two body erosion experiments, developed to appraise the volume loss of the elements when consigned to varied test conditions. The operations incorporate the rubbing of enamel cylinders against specified composite disks. The standard results of these tests divulge that the glass and quartz fillers require the silane coupling agent to help safeguard against the destructive rate of wear (Critchlow 2012, p. 47). An equally important revelation is that glass fillers are more prone to abrasion than quartz substances.

- **Wetting**

Experts have employed multiple tests such as the MO and DO measures to ascertain the wetting properties of dental composites (Gatti et al. 2007, p. 629). The following are their discoveries: the strike angles of water onto the dentin and enamel are 600 to 80012 and 450 to 60012 respectively. As regards the non-bond BISGMA fillings, the contact angle equals 600 to 65013. As required by the health practices, the wetting attribute of a composite should be negligible to impede staining and corrosions, cautions Calhoun (2011, p. 36). Following these findings, they advocate for the application of the hydrophobic composites as opposed to the hydrophilic versions (Cramer, Stansbury & Bowman 2011, p. 404). The underlined emphasis is because the hydrophobic models curtail marginal leakages in combination with eliminating water penetration. By contrast, the hydrophilic ones lack the chemical bonding property thus elevating water penetration, even in cramped crevices.

- **Polymerization contraction**

According to Shalaby and Salz (2007, p. 64), it is imperative to use pre-polymerized clusters as they ameliorate the contraction qualities present in resin composites. Tremendous contraction

and shrinkage stresses debilitate the chemical bonding capability between the fillers and the tooth outline (Gatti et al. 2007, p. 630). High content levels of unpolymerized resin elements in composites precipitate high tensile and contraction rates, thus, engendering non-bonding properties.

- **Novel Materials**

Weng et al. (2012, p. 1554) delineate novel materials as those innovative dental restorative schemes that strive to depict the supremacy and prevalence of the conventional oral environment. The National Institute of Dental and Craniofacial Research is advancing the composite polymer as an indispensable agent in the dentin, enamels, fillers, and adhesive correlations. The organization is relentlessly advocating for in-depth research and exploration of this polymer agent (Kleverlaan & Feilzer 2005, p. 1157). The researchers implicated in this advancement include material scientists, chemical engineers, clinicians, microbiologists, organic chemists, polymer chemists, as well as computational polymer scientists. Other prominent investigators encompass scientists engaged in vivo, in vitro, and cement formulation research. As Ergucua and Turkun (2007, p. 209) assert, the novel material (composite polymer) must assimilate a thorough evaluation of the physiological oral and microbial setting. Its design must take into account individual capabilities such as enamel interface integration, self-heal functionalities, and biomimetic features (Jin et al. 2013, p. 69).

This modernistic composite restorative element must satisfy the set benchmarks such as low shrinkage, mechanical preeminence, aesthetics, and biocompatibility. Additionally, it should not be subject to esterase, enzyme damage, oral cavity decadence, polymer agent leaching, and adverse handling properties (Demarco 2012, p. 89). The NIDCR forecasts that the material will have an interminable service life than the commercially available fillers. The unraveling of the novel composite polymer will trigger scientists also to revamp the pertinent dentin & enamel bonding substances, coupling agents, and fillers among other features (Fraunhofer 2010, p. 44). The Funding Opportunity Announcement will conduct an encyclopedic evaluation and innovation to facilitate diminished hydrolytic, oxidative degeneration, as well as a reduced enzymatic reaction. The end goal is that the imminent substance will impede low pH of levels ranging between four and five, and incessant cyclic fatigues, therefore, withstanding intense chewing forces (Goldberg 2014, p. 41). Another novel material under survey is the new antibacterial resin composite that constitutes a furanone derivative (*Dental health and tooth fillings* 2015). This element comprises supplemental benefits including enhanced mechanical strengths, antibacterial activities, decreased wetting attributes, and adequate compressive strength.

Conclusion

In conclusion, dental composites are the filling agents used by dentists and other dental specialists to seal teeth cavities and reconstruct teeth decay. The commercially available filler elements include glass ionomers, ceramics, amalgams, cast gold, and composite resins. Researchers and governments invest extensive time and funds in exploring the distinctive characteristics and properties of each composite filler. Modulus of elasticity, wear, solubility, color stability, tensile stress, as well as polymerization contraction constitute some of the

fundamental parameters employed in determining composite suitability. As time advances, various concerned organizations and entities have engaged themselves in the modification of composite materials. Their core objective in this fight is to augment the afflicted dental, craniofacial, and oral tissues and organs by introducing improved bioengineering and biomaterials investigation techniques.

References

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