Resin Polymers Based Tooth Coloured Filling Dental Materials

Zohaib Khurshid¹,², Saad Liaqat³, Muhammad S. Zafar⁴,*, Sharia Najeeb⁵, Sana Zohaib⁵ and Mothanna Alrahabi⁴

¹ School of Metallurgy and Materials, University of Birmingham, UK
² Department of Biomedical Engineering, College of Engineering, King Faisal University, KSA
³ Biomaterials and Tissue Engineering Division, UCL Eastman Dental Institute, 256 Gray's Inn Road, London, UK. WC1X 8LD
⁴ College of Dentistry, Al-Taibah University, KSA
⁵ Department of Restorative Dentistry, Al-Farabi College, Riyadh, KSA

The aim of this chapter is to compile history, chemistry and other properties of resin polymers in dentistry. Today, teeth can be filled with gold, porcelain and amalgam; or tooth-coloured resin based materials such as glass-ionomer cements and polymer composites [1]. The location and extent of the decay, cost of filling materials, patients' insurance coverage, and dentist's recommendation assist in determining the type of filling used. Polymer based composites were commercially introduced in the mid – 1960s. Initially it was indicated for restoration of anterior teeth. Since then dental composites have gone through marked improvement in its mechanical and physical properties, durability, wear resistance, and manipulative qualities. More recently, research has been carried out on re-mineralising, anti-bacterial, and self-adhesive properties of dental resin composites. As a result, dental resin composites are widely used instead of conventional amalgam. Today, they are the most commonly available materials in dentistry as they are used for a number of clinical applications in dental clinics. It can be used as a filling material, as a luting agent, sealant, and in indirect restorations. Dental polymer composites mainly have three major components: inorganic fillers, an organic polymer matrix, and a coupling agent. The fillers can be glass or other reinforcing fillers. The matrix is mainly formed from high molecular weight monomers such as urethane di-methacrylate (UDMA), and bisphenol A-glycidyl methacrylate (Bis-GMA) see figure-1 [2].

Fillers are added to increase strength, reduce polymerisation shrinkage and heat generation. A silane coupling agent is used to augment the bond between these two components and to aid filler distribution [3]. An initiator and activator are usually added to begin and later control the polymerisation process when external energy (light) is applied. The choice of appropriate monomers for the composite formulation strongly influences the viscosity, reactivity, and polymerization shrinkage of the composite paste, as well as the mechanical properties, water uptake and swelling of the cured composite. The properties of dental composites are significantly influenced by the fillers employed. According to the nature and the particle size of the filler the dental composites have been classified into four main groups, traditional composites, micro-filled composites, hybrid composites, and small particle hybrid composites [3].
The main drawbacks for most composite restorations are polymerisation shrinkage, complex adhesive procedures for bonding to dentine, and brittle fracture. Composites also have no anti-bacterial properties, and tend to accumulate more biofilm, and plaque in vivo than other restorative materials [4–6].

**Keywords** Polymer composites; Dental resins; Tooth filling materials

**References**


