

In dental restorative fillings, bioglass promotes tooth remineralization and prevents formation of secondary caries by releasing calcium and phosphate ions that fills the micro gap between material-tooth interface and inhibits the colonization of bacteria on the dental fillings (Kessler and Lee, 2006; Choi et al., 2008). In one study, successful remineralization of demineralized dentin has occurred by applying Bioglass 45S5 direct on surface (Schulze et al., 2005). Sauro et al. (2012a) investigated the therapeutic effect of Bioglass 45S5 in his study and showed increased mechanical properties and reduced the micropermeability along the dentin-bonded interface by therapeutic remineralization of imperfect mineral-depleted areas (Sauro et al., 2012b). It is also reported that bioglass-based dental composites showed superior mechanical properties such as flexural strength, fracture toughness and crack resistance as compared to commercially available dental composites (Khvostenko et al., 2013).

Bioactive glass was reported and shown to decrease the maximum strength significantly (Pirhonen et al., 2006). Coating the bioactive glass with a polymer can result in reducing the abrasion or in some cases avoided as well as fabrication of continuous bioactive glass fibers. Coating will result in various thicknesses of glass fibers that can be achieved via two popular methods of dipping and pulling. Dipping is a suitable method to achieve a thickness between 2 and 5 μm while pulling was used to obtain thicker fibers (about 10–30 μm). Coating will also improve mechanical properties as well as handling. Compression molding was a useful technique to fabricate porous bioactive glass fiber, which gives osteoconductivity to the entire biomaterial. Bioactive glass coating on metallic implants such as enameling, plasma spraying, ion beam sputtering, laser cladding, pulsed laser deposition, and sol-gel techniques have been used in the last few years in order to provide an interfacial attachment to the bone tissue as well as extra protection from corrosion (Schrooten et al., 1999). The only problem with these techniques is the use of high temperature for coating, which limits the use of coating for biomaterials such as ceramics and metallic only and therefore, polymer will be eliminated from these techniques due to high temperature.

In the following section, we will review biomedical applications of bioactive glasses, which need to be considered prior to fabrication and characterization of any medical application and then some medical applications including orthopedic and dental applications will be discussed.

17.1.4 Biomedical Applications

17.1.4.1 Orthopedic Application

Bioactive glasses were originally used as bone-grafting materials, which bond directly to the tissues. The bonding between glass and live tissue is due to a series of cell-surface reactions. Detailed knowledge of biological and cell-surface reaction is so crucial for selecting suitable bioactive glasses in