surface area leading to higher bioactivity (Montazerian and Zanotto, 2017; Hupa, 2011). While melt-derived BGs are limited to a SiO_2 content ≤60 mol%, sol-gel glasses can have up to 90 mol% SiO_2 due to an excess of −OH groups incorporated during fabrication (Montazerian and Zanotto, 2017).

Besides different production techniques, also numerous compositions of BGs are being continuously investigated, for example, silicate, phosphate, and borate glasses, and also glass-ceramics. However, BGs are in general not suitable for load-bearing applications, such as large bone replacement implants. Therefore, for orthopedic applications, one common approach is to develop metal implants coated with BGs and glass-ceramics (Krause et al., 2006; Baino and Verne, 2017). In this way, the superior mechanical properties of metals (e.g., Ti alloys, stainless steel) are combined with the bone-bonding ability of BGs.

Numerous coating techniques for BGs are available (Baino and Verne, 2017). One of these techniques is electrophoretic deposition (EPD) which is not only a cost-effective method that can be used at room temperature, but it is also very versatile, allowing the coating of 3D objects like screws, curved implants, or porous scaffolds (Boccaccini et al., 2010).

This chapter focuses on the application of EPD to develop BG-based coatings, including a section on the fundamentals of EPD. Then, an overview of research on BG coatings by EPD is presented. Further, the drawbacks of bare glass coatings are discussed and ways to overcome this problem by developing BG-polymer composites are shown. Typical BG-biopolymer composite coatings produced by EPD are comprehensively discussed. The chapter finalizes with a description of relevant methods used to characterize biomedical coatings.

1.2 ELECTROPHORETIC DEPOSITION

EPD is the motion of charged particles or molecules dispersed in a suspension under the influence of an electric field (electrophoresis) and the subsequent coagulation of the particles at the oppositely charged electrode (Boccaccini et al., 2010; Besra and Liu, 2007; Neirinck et al., 2013).

The basic set-up consists of a two-electrode cell (see Fig. 1.1) with the substrate to be coated acting as one of the electrodes. For deposition, an electrical conductive substrate is needed. However, adapting the set-up properly, nonconductive substrates can also be infiltrated by EPD (Boccaccini et al., 2010).

The EPD process was discovered in the 1740s by Bose (Boccaccini et al., 2010; Pickard, 1968) and described in 1808 by the Russian scientist Reuss, who observed the movement of clay particles dispersed in water under the influence of an electric field. The first practical application was the deposition of thoria particles and tungsten on platinum cathodes by Harsanyi in 1927. In the 1950s, the first large-scale applications of EPD were reported (Amrollahi et al., 2015; Corni et al., 2008) and increased interest in EPD developed further with the coming of nanotechnology, given the capability of the method to manipulate nanoparticles in suspension (Corni et al., 2008). Moreover, the