reactive materials bond well with the living tissues through physical or chemical reactions that enable bioactive joining of the implants (Cao and Hench, 1996). The surface modifications of implants have been recommended as they could lead to superior osseointegration (Mendonça et al., 2008).

Commonly used bioactive coatings for dental implants included calcium phosphates (CaP) such as hydroxyapatite (HAP) (Alghamdi et al., 2013; Barkarmo et al., 2013, 2014), polyether ether ketone (Najeeb et al., 2016b; Zhou et al., 2014) and nano-diamonds (Najeeb et al., 2016c; Behler et al., 2009). These bioactive materials are generally biostable (i.e., calcium phosphates) or bioresorbable (i.e., bioactive glasses) and are not suitable in the bulk form; thus, they are usually applied as bioactive coatings on these metallic implants to improve chemical resistance and enhance durability and biocompatibility (Cotterill, 1985; Williams et al., 1990). In addition to bioactivity and enhancing the implant osseointegration, the surface coatings may be used for therapeutic purposes such as antibiotics and other medicaments (Javed et al., 2016; Bumgardner et al., 2007; Husain et al., 2017; Najeeb et al., 2017a; Jacobsen et al., 2013).

It is proven that bioactive implants present no toxicity, inflammation, or foreign body response (Kilpadi et al., 2001). In addition, the CaP-coated implants bond well with the living bone since 65% of bone mass consists of carbonated CaP (Vallet-Regí and Arcos, 2008); thus, patients receiving bioactive implants recover quicker (Kilpadi et al., 2001). The properties of CaP coatings are dependent on many factors such as crystallinity, phase purity, coating thickness, porosity, and adhesion to the substrate (De Groot et al., 1998). Bioceramics such as CaP are extensively used due to its superior performance in biological applications and explored widely to compare the biological profile of bioactive implants to uncoated ones (De Lange and Donath, 1989; Geesink et al., 1988; Fath et al., 1989; Dorr and Smith, 1992; Cook et al., 1992; Golec and Krauser, 1992; Jarcho, 1992; Kay, 1992; Howlett et al., 1994; Manley and Koch, 1992; Tisdel et al., 1994; Gronowicz and McCarthy, 1996; Boyan et al., 1996; Ozawa and Kasugai, 1996; Lacefield, 1998; Vercaigne et al., 1998; Puleo and Nanci, 1999; Matsuura et al., 2000). This chapter describes various techniques and bioactive materials used for coating dental implants. In addition, key features and benefits of such coatings have been discussed.

11.2 SURFACE COATING TECHNIQUES FOR DENTAL IMPLANTS

There are several techniques available to achieve these properties of calcium phosphate coated implants for use in dental applications. These techniques are classified into two subgroups: physical or dry techniques and chemical or wet techniques. Physical techniques exceed in performance in relation to coating adhesion with implants surface when compared with wet techniques. Nevertheless, most of the physical techniques are line of sight techniques and