43–51 nm. The morphology of the magnetic BG nanoparticle can be seen after TEM analysis. These composite nanoparticles have a structure of iron oxide inside the polymer-bioglass matrix. The advantage of using nanoscale BGs instead of micron-sized BGs is their superior osteoconductivity. The magnetization measured was 6.369 emu/g. The results revealed that the composite can be applicable for drug delivery allied with hyperthermia treatment.

The study of magnetic bioactive glass-ceramics for hyperthermia treatment of cancer is continuously progressing, providing new alternatives for cancer treatment. Tailoring the properties of the material and the magnetic field parameters has a significant effect on heat generation in biological tissues. In vivo studies of the temperature distribution over time under oscillating magnetic fields will bring new knowledge on the successful elimination of cancerous tissue by magnetic hyperthermia.

10.3.3 Bioactive Glass Applied in Brachytherapy

Brachytherapy is a radioactive-based modality for cancer treatment, which offers the opportunity of placing the radiation source inside the diseased tumor to deliver a therapeutic dose β radiation emission into the cancerous tissue in situ without damaging the nearby healthy tissue (Ngwa et al., 2014). Radiotherapy is classified into external and internal radiotherapy (brachytherapy). The radioactive source is placed outside the patient in external radiotherapy, while in brachytherapy, radioactive seeds are placed inside the cancerous tissue. Therefore, for external radiotherapy, high doses of β and/or γ rays from the radioactive source pass through healthy tissues toward the cancer tissue. This process damages both the healthy and malignant tissues. Normally, healthy tissues absorb around 60% of the total radiation in external radiotherapy (Aspasio et al., 2016b).

The advantage of brachytherapy, compared with conventional radiotherapy techniques, is its high dosage delivered into the tumor, due to the seed's proximity to the cancer tissue (Aspasio et al., 2016a). Most commercialized seeds are made of a metallic capsule containing ^{125}Iodine as a radioactive element (Lawson, 1999; Gobardhan et al., 2013; Goudreau et al., 2015). However, the metallic capsule is inert to the tissue, surgeries are needed to bring them in and take them out, and ^{125}I has a relatively long half-life (54.9 days) (Richmond and Findlay, 1966). Yttrium-90 (^{90}Y) is an excellent alternative radioisotope for this application because it could be produced by neutron activation of naturally abundant ^{89}Y, with an acceptable half-life of 64.2 hours, and emitted β radiation that has an average range in soft tissue of only 2.5 mm (Giammarile et al., 2011; Hench et al., 2010; Hadadi et al., 2013) (Table 10.2). This short-range radiation minimized the amount of radiation reaching healthy tissue (Hench et al., 2010).

Radioactive glass particles/microspheres can be delivered to a target organ using either the bloodstream or by injection into the tumor directly. In the early 1960s, polymer microspheres coated with radioactive ^{90}Y were used to irradiate