drug delivery and superior bioactivity, which show great potential for clinical application. It is believed that the combination of efficient drug delivery and inherent bioactivity of mesoporous bioactive glass will provide more options to treat cancer clinically.

10.4 CHALLENGES AND PERSPECTIVE

To summarize, the various applications of BGs for cancer treatment, their versatility, and lack of adverse effects have been demonstrated; however, several challenges still remain, and studies are currently underway to investigate further prospective applications for clinical usage.

Numerous clinical hyperthermia trials using MBGs in combination with radiotherapy and/or chemotherapy have achieved good control of malignant tumors. Currently, however, MagForce AG is the only company that has received EU-wide regulatory approval for treatment of brain tumors (Ortner et al., 2012). Further investigations are needed to test and develop this technique before it can be employed as a standard therapy for cancer treatment. The benefits of the application of the hyperthermia approach, as compared to conventional treatments, are expected to be accompanied by a direct health service cost reduction and improvement in the quality of life of the patients. Currently, one of the priority challenges of MBGs is the simultaneous enhancement of bioactivity and magnetization properties. The presence of the magnetic phase in the glass matrix decreases the bioactivity (Li et al., 2011b). Moreover, iron can be easily segregated, forming nonmagnetic precipitates while sintering (Li et al., 2011b). The possible cytotoxicity of the magnetic phase acts as a limiting factor for their applications. Furthermore, the use of low concentrations of iron oxide can lead to an insufficient amount of the magnetic phase to generate the heat demanded when under an oscillating external magnetic field, decreasing the effectiveness of the treatment.

Mesoporous BGs have demonstrated successful use in drug delivery and cancer treatment applications (Li et al., 2011b). These materials also have superior bioactivity, showing great potential for clinical applications. The combination of efficient drug delivery and the inherent bioactivity of mesoporous BGs may provide additional options for clinical treatment of various types of cancer (Wu and Chang, 2012). The mesoporous architecture can introduce a large surface area, acting as a local drug release system for cancer treatment. Currently, there are no large-size mesoporous BGs on the market, as it took until 2002 for the first porous bioactive glass scaffold with suitable pores to be developed. The reason for this is that the original Bioglass 45S5 crystallizes as the particles are sintered together (Hench and Jones, 2015). The glass transition temperature (T_g) and peak crystallization temperature are two very important properties of a glass (Farooq et al., 2012). A wide processing window between these two temperatures ensures that the glass sinters without crystallization (Farooq et al., 2012). If a bioactive glass crystallizes, the bioactivity decreases because the