Chapter 13

Bioactive Glasses and Glass-Ceramics for Ophthalmological Applications

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13.1 INTRODUCTION

Glass has a long history that accompanies many of the major achievements in the life and development of human beings on Earth (Rawson, 1988). One of the most important applications of glass since the ancient times concerns the fabrication of optically clear lenses to magnify objects or correct visual deficiencies of the eye (e.g., myopia, blurred vision). Apart from being used to manufacture external portable lenses, glass has also been surgically implanted as an optical element in the eye to restore proper vision. Table 13.1 chronicles the major achievements in the field of glass-based implantable ocular devices since the beginning of the modern era to the present. In this regard, the first well-documented evidence was reported in Giacomo Casanova's diaries, where the great lover described a meeting with an Italian itinerant ophthalmologist, Tadini, in 1765 (Fechner et al., 1979). Tadini, during his work in Warsaw, planned to implant a polished sphere of glass into the eye of a human patient suffering from cataract. However, this operation was not attempted and the first implantation of a glass lens was performed 30 years later in Dresden by the ophthalmic surgeon Casaamata, who was probably inspired by Casanova's story (Prost, 1995). This is generally recognized as the first attempt—albeit unsuccessful—to replace a diseased crystalline lens via implantation of an artificial intraocular lens (IOL). It was necessary to wait for almost two centuries before a poly(methyl methacrylate) (PMMA) lens was successfully implanted in human eyes after cataract surgery (Apple and Sims, 1996). PMMA has been commonly used till now to produce IOLs, whereas glass was shown to be unsuitable due to its too high density (Bozukova et al., 2010).

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