Effect of silver nanoparticle addition on the structure and characteristics of radio-photoluminescence glass dosimeter

ABSTRACT

A series of silver-activated phosphate glass was prepared by melt quenching method. The effect of silver nanoparticle addition on the phosphate glass microstructure, composition and chemical characteristics was investigated using x-ray diffraction, fourier transform infrared and photoluminescence spectroscopy. Other physical property such as density was also evaluated. The density increased when the amount of silver ions were increased, due to the enhanced formation of non-bridging oxygen. In this study, we discuss the emission mechanism of two radio-photoluminescence peaks at 460 nm and 620 nm, where the electrons and holes produced by ɔ-irradiation a re-trapped by Ag+ ions to produce Ag0 and Ag2+ ions respectively, when the Ag+-doped phosphate glass is exposed to ɔ-ray. We proposed that an emission mechanism of 460 and 620 nm radio-photoluminescence peaks with these Ag2+ and Ag0 ions. Furthermore, a correlation between the investigated properties and glass composition is discussed.

Keyword: Optical and physical properties; Radio-photoluminescence glass dosimeter; Silver nanoparticle