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Thermoluminescence properties of Yb-Tb-doped SiO₂ optical fiber subject to 6 and 10 MV photon irradiation

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Abstract

This paper reports thermoluminescence characteristics of thermoluminescence dosimetry 100 chips and Yb-Tb-doped optical fibers irradiated with 6 and 10 MV photons. Thermoluminescence response of both dosimeters increases over a wide photon dose range from 0.5 to 4 Gy. Yb-Tb-doped optical fibers demonstrate useful thermoluminescence properties and represent a good candidate for thermoluminescence dosimetry application with ionizing radiation. The results of this fiber have been compared with those of commercially available standard thermoluminescence dosimetry-100 media. Commercially available Yb-Tb-doped optical fibers and said standard media are found to yield a linear relationship between dose-and thermoluminescence signal, although Yb-Tb-doped optical fibers provide only 10 % of the sensitivity of thermoluminescence dosimetry-100. With better thermoluminescence characteristics such as small size (125 μm diameter), high flexibility, easy of handling and low cost, as compared to other thermoluminescence materials, indicate that commercial Yb-Tb-doped optical fiber is a promising thermoluminescence material for variety of applications.

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