

Developments in Production of Silica-Based Thermoluminescence Dosimeters

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Abstract

This work addresses purpose-made thermoluminescence dosimeters (TLD) based on doped silica fibres and sol-gel nanoparticles, produced via Modified Chemical Vapour Deposition (MCVD) and wet chemistry techniques respectively. These seek to improve upon the versatility offered by conventional phosphor-based TLD forms such as that of doped LiF. Fabrication and irradiation-dependent factors are seen to produce defects of differing origin, influencing the luminescence of the media. In coming to a close, we illustrate the utility of Ge-doped silica media for ionizing radiation dosimetry, first showing results from gamma-irradiated Ag-decorated nanoparticles, in the particular instance pointing to an extended dynamic range of dose. For the fibres, at radiotherapy dose levels, we show high spatial resolution (0.1 mm) depth-dose results for proton irradiations. For novel microstructured fibres (photonic crystal fibres, PCFs) we show first results from a study of undisturbed and technologically modified naturally occurring

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