Simultaneous microbeam IBA and beam-induced luminescence analysis of strained doped silica fibre radiation dosimeters

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Abstract

We demonstrate that the simultaneous combination of ion beam analysis (IBA) and ion beam induced luminescence (IL) can reveal valuable information concerning the performance of strained doped silica fibre thermoluminescence microdosimeters. The micron scale spatial resolution and low detection limits of IBA allow the lateral distribution of dopant elements to be mapped and then correlated with the distribution of prompt radioluminescence. Measurement of the decay of the IL signal with dose provide information concerning the saturation of the subsequent TL signal at high doses. MeV ion beams can deposit relatively high energy in localized, well-quantified small volumes and so this method is valuable for studying high dose effects in TL dosimeters. We describe a simple modification of the target chamber microscope which enables sensitive low background light detection in two wavelength bands and present preliminary results from three types of germanium doped silica fibre dosimeter.

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