

## **Response of fabricated germanium optical fibre subjected to low dose neutron-gamma irradiation**

### **ABSTRACT**

The main purpose of this study is to establish the thermoluminescence response (TL) of fabricated 6% mol Ge-doped optical fibre towards a low dose neutron-gamma irradiation which includes dose linearity, fading signal, minimum detectable dose (MDD) and glow curve analysis. A cylindrical optical fibre with outer diameter of (604  $\mu\text{m}$  and 483  $\mu\text{m}$ ) and flat optical fibres with outer dimension of 620x 165  $\mu\text{m}$  were employed in this study. All fibres were exposed with mixed neutron-gamma radiation that emitted from a  $^{241}\text{Am}$ -Be radiation source located at Neutron Laboratory, Nuclear Science Building, Universiti Kebangsaan Malaysia for 5-, 7-, 14-, 21-, and 28 days. The source to the sample distance was set at 5 cm. For fading effect, the samples were kept at room temperature and read-out up to 71 days' post-irradiation. The glow curve and the minimum detectable dose were evaluated using the glow curve which was plotted using Microsoft Excel software and also corresponded with the formula found in Furetta et al. (2001). All the fabricated optical fibres showed a dose linearity response for a range of dose given at 30, 50, 101, 151 and 201 mGy. The minimum detectable dose for 604  $\mu\text{m}$  and 483  $\mu\text{m}$  cylindrical optical fibre was 0.25 mGy and 0.42 mGy. Meanwhile, for 620  $\mu\text{m}$  flat optical fibre, the detectable dose was 1.13 mGy. At 71 days' post-irradiation, all the fibres showed less than 30% of signal fading. Moreover, single broad peak can be found for cylindrical fibre and double peak for flat fibre. These results show that fabricated Germanium optical fibre gives a good response to a low dose mixed gamma-neutron irradiation.

**Keyword:** Optical fibre; Low dose; Mixed neutron-gamma; Dosimetry