

## **The thermoluminescence response of doped SiO<sub>2</sub> optical fibres subjected to fast neutrons**

### **ABSTRACT**

This paper describes a preliminary study of the thermoluminescence (TL) response of doped SiO<sub>2</sub> optical fibres subjected to <sup>241</sup>AmBe neutron irradiation. The TL materials, which comprise Al- and Ge-doped silica fibres, were exposed in close contact with the <sup>241</sup>AmBe source to obtain fast neutron interactions through use of measurements obtained with and without a Cd filter (the filter being made to entirely enclose the fibres). The neutron irradiations were performed for exposure times of 1-, 2-, 3-, 5- and 7-days in a neutron tank filled with water. In this study, use was also made of the Monte Carlo N-particle (MCNP5) code version 5 (V5) to simulate the neutron irradiations experiment. It was found that the commercially available Ge-doped and Al-doped optical fibres show a linear dose response subjected to fast neutrons from <sup>241</sup>AmBe source up to seven days of irradiations. The simulation performed using MCNP5 also exhibits a similar pattern, albeit differing in sensitivity. The TL response of Ge-doped fibre is markedly greater than that of the Al-doped fibre, the total absorption cross section for Ge in both the fast and thermal neutrons region being some ten times greater than that of Al.

**Keyword:** Thermoluminescence, SiO<sub>2</sub> optical fibres, Fast neutrons, Monte Carlo N-particle (MCNP)