**EPR study of luminescence-based radiation dosimeters**

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**Abstract**

Electron paramagnetic resonance (EPR) is a physical method to observe resonant absorption of microwave power by unpaired electron spins in a magnetic field. It is able to detect, identify and quantify free radicals, such as those present in irradiated materials. This makes it a reliable dosimetric technique, using e.g. alanine, tooth enamel and sucrose for retrospective/accident dosimetry, detection of irradiated food, etc. It has been used in geology, chemistry, physics, medicine, environmental sciences, archaeology, and industrial irradiations. \(^1\) In the present study we discuss results on two classes of materials, i.e. LiF:Mg,Ti /LiF:Mg,Cu,P and Al\(_2\)O\(_3\) :C /Al\(_2\)O\(_3\) :C,Mg. These materials are used in thermoluminescence dosimetry (TLD) and Optically Stimulated Luminescence dosimetry (OSLD)/Radiophotoluminescence dosimetry (RPLD) respectively. These techniques have developed considerably since the 1960s and are used for a wide range of applications, such as personnel, medical and environmental ionizing radiation dose assessment.\(^2,4\) Although EPR can in terms of dose sensitivity not compete with the luminescence methods mentioned above, it can provide complementary insight into the defects and processes leading to luminescence. All samples were measured before and after X-ray irradiation in two different frequency bands (X- and Q-band). In powder samples of unirradiated LiF:Mg,Cu,P a strong signal was detected (Fig. 1). It did not show (X)-radiation sensitivity and also no other signals resulting from irradiation could be detected. The native signal of LiF:Mg,Cu,P has been tentatively identified in literature\(^5\) as related to Cu\(^{2+}\), although its characteristics are not evidently compatible with such an assignment. Therefore ENDOR experiments have also been tested. The Al\(_2\)O\(_3\) -based and LiF:Mg,Ti powder samples have no significant EPR signal present before irradiation, but do reveal a signal after irradiation.

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