

Confocal fluorescence microscopy and confocal Raman microspectroscopy of X-ray irradiated LiF crystals

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X-ray detectors based on the photoluminescence of radiation-induced color centers (CCs) locally produced in lithium fluoride (LiF) crystals will be discussed. Among the peculiarities of LiF-based detectors, noteworthy ones are their very high intrinsic spatial resolution across a large field of view, wide dynamic range and versatility. LiF crystals irradiated with monochromatic X-rays (8 e 16 keV) at Anka synchrotron light source (Karlsruhe, Germany) and with the broadband white beam spectrum of the synchrotron bending magnet have been investigated with optical spectroscopy, laser scanning confocal microscopy in fluorescence mode and confocal Raman microspectroscopy. The penetration depths in LiF of the X-rays used for irradiation allowed to produce volumetric distributions of CCs in the crystals. 3D characterizations of the X-ray-induced CC distributions have been performed with both confocal techniques. The combination of capability of a LiF crystal to register volumetric X-ray mapping with the optical sectioning operations of the confocal techniques has allowed performing 3D reconstructions of the X-ray colored volumes and it could provide advanced tools for 3D X-ray detection.

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