Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

AVVISO DI SEMINARIO

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Perspectives of color centers photoluminescence in lithium fluoride for proton beam diagnostics and radiotherapy

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In recent years, the use of protons and carbon ions in oncological radiotherapy has grown remarkably, due to the release of most of their energy at the end of their path in tissue with modest lateral diffusion, thus preserving the surrounding healthy organs. The use of these ionizing radiations has given a new prompt to the investigation of materials and to the development of optical technologies to be used for dosimetric characterization of these particle beams in hadrotherapy.
Some results of the investigation of lithium fluoride (LiF) crystals, thin films and pellets, for their application in dosimetry, by exploiting the highly efficient visible photoluminescence of stable laser-active F_2 and F_3^+ aggregate color centers created in the material by ionizing radiations, will be presented. Although doped LiF has been used for several decades in dosimetry as a thermoluminescent detector, investigations of the photoluminescence properties of radiation-induced color centers in nominally-pure LiF at doses typical of radiotherapy are almost not present in the literature.
The photoluminescence of color centers in LiF has been exploited for characterizing the proton beams during the commissioning of the TOP-IMPLART linear accelerator under development at ENEA C.R. Frascati. Within the framework of the ENEA project TECHEA (www.techea.enea.it), the photoluminescence response of LiF with dose has been calibrated with the reference ^{60}Co gamma beam at INMRI, in ENEA C.R. Casaccia. It has been studied after irradiation with 6 MV X-rays produced by a clinical radiotherapy machine and with high-energy protons produced by the synchrotron of CNAO, in Pavia, currently used for protontherapy. Finally, some preliminary results obtained with LiF crystals as fluorescent nuclear track detectors of low-energy protons for radiobiology studies, will be presented, as part of the BIOTRACK project (www.biotrack.enea.it).

International Day of Light 16 May

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