development of CaSO4:Tm,Li, CaSO4:Tb,Li and CaSO4:Eu,Li composites for application in beta radiation dosimetry, using luminescent techniques such as thermoluminescence (TL) and optically stimulated luminescence (OSL). The CaSO4 crystals were produced by the adapted slow evaporation route and characterized using X-ray diffraction (XRD), radioluminescence, TL and OSL techniques. XRD analyses showed that the doped CaSO4 samples presented a single phase, with orthorhombic symmetry. The CaSO4:Eu,Li composites showed TL signals between 100°C and 200°C, with peaks around 145°C and 180°C. The CaSO4:Tb,Li and CaSO4:Tm,Li composites showed TL signals between 100 °C and 350 °C, with peaks around 165 °C and 275 °C. All samples were irradiated with a 90Sr/90Y source from the TL/OSL Risø reader. For the CaSO4:Tb and CaSO4:Tm samples, the addition of lithium as co-dopant resulted into a significant increase (2x) in the total TL signal of the samples. The CaSO4:Tm,Li samples presented a very intense OSL signal, about 80x greater than the signal of the other samples produced. This allows the applicability of TL/OSL detectors even more sensitives. The OSL decay of the CaSO4:Eu,Li and CaSO4:Tb,Li samples is dominated by a fast decay while the OSL signal of CaSO4:Tm,Li composites decays slowly and remains stored for a long time. The TL emission spectra of the samples showed typical emissions of Eu2+ ions (280 nm), Eu3+ (614 nm), Tb3+ (544 nm) and Tm3+ (455 nm). As no emission corresponding to lithium was identified in the emission spectra, it can be assumed that lithium acts as a capture center and transfers its energy to the nearby TR3+, which increases the emission intensity. All the samples produced showed linearity in the dose range used, good reproducibility, with variations below 10%, and minimum detectable doses of the order of micrograys. The evaluated dosimetric characteristics denote that the developed composites have potential application as TL/OSL dosimeters.

ID_199

Title of the abstract: Potential of red thermoluminescence of surface mount resistors from smartphones for retrospective dosimetry

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Abstract: There is a high scientific interest in using personal items as emergency dosimeters and smartphones, being extremely widespread and carried along wherever people go, seems to be a particularly useful object in this context. Of the different components of mobile phones that have been studied, the alumina substrate of surface mount resistors (SMRs) found on the circuit board seems to be most promising material when readout using OSL, in terms of sensitivity, low intrinsic background and homogeneity of fading characteristics. One of the drawbacks is however the need to sample at least 10 resistors for a dose assessment. This implies destruction of the smartphone and modern phones tend to have fewer and fewer resistors. In this work the potential of the red TL of SMRs is investigated for retrospective dosimetry to overcome these issues. This emission is due to the Cr(3+) impurity and shows an intensity that surpasses the intensity of the blue emission by up to two orders of magnitude. This dramatic increase in sensitivity enables the dose assessment on a single resistor when using a red sensitive PMT. Samples from different phones were characterized according to dose response, detection limit, intra-sample and inter-sample variation in intrinsic background and fading. Irradiation trials on intact smartphones demonstrated that dose assessment down to 20 mGy is possible at the single resistor level, up to 30 days after exposure.

ID_200

Title of the abstract: Evaluation of TL and OSL responses of recycled crab shell biowaste for radiation dosimetry

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Abstract: The aim of this work was to evaluate the applicability of crab shell biowaste composites as thermoluminescent (TL) and optically stimulated luminescent (OSL) detectors, since recent researchers have found it to be a valuable intrinsic luminescent material. The waste of crabs shells (Ucides cordatus) species was taken from a bar located at Atalaia beach in Aracaju city, Sergipe State, Brazil, and calcined at 800 °C for 2 h. The calcined crab shell powder was mixed with Teflon (2:1 mass ratio) and molded in pellets of 6 mm diameter and 1 mm thickness. The pellets were sintered at 400 °C for 1 h. The luminescent and dosimetric characterization of the crab shell composites were performed using a TL/OSL Risø Reader, model DA-20. The crab shell composites showed TL signals between 100°C and 400°C, with an intense peak around 155°C and a less intense peak around 350°C. The first peak, although at a relative low temperature, can be used as a dosimetric peak, due to its high intensity and acceptable fading (12% after 7 days). The OSL signal of the samples was very intense and with a very fast decay, which means that the luminescent centers are easily optically stimulated by the reader blue LEDs. The emission spectra of the samples showed a broad emission from 300 nm to 400 nm. All samples produced showed variation coefficients for homogeneity and reproducibility below 9.5%, in addition to a linear response in the dose range used (80 mGy to 1 Gy) and minimum detectable doses of the order of miligrays. Evaluating the dosimetric applicability, the crab shell composites presented potential application as TL/OSL detectors in processes that employ ionizing radiation such as beta particles, X and gamma rays.

ID_201

Title of the abstract: A new irradiation facility for non-destructive analysis with X-rays: Monte Carlo simulations, spectrometric and dosimetric characterization

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Astract: As part of the Energy for Motion (EFM) project, the Nuclear Measurements Laboratory of Politecnico di Milano is designing and developing a new irradiation facility for non-destructive testing. The facility is based on a high-power medical X-ray tube (RTC1000HS by IAE) and will be devoted to two main activities. On one side, the morphological analysis of electrochemical devices via X-ray Computed Tomography (XCT), to support the research activities in the field of electrochemical device engineering performed within the EFM project. On the other hand, the facility will be used for applications in dosimetry, specifically: i) the generation of the ISO 4037 N-series spectra for the calibration of protection-level dosemeters; ii) total ionizing dose (TID) tests of small electrochemical devices for space applications. The facility, which is under continuous development, consist of the X-ray source, a positioning system with a