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Abstract: Interventional cardiology professionals are recognized as the more exposed to X-rays in a hospital environment. However, dosimetry results Regulated personnel sometimes do not portray these exposure conditions. This work aims to estimate the doses received by cardiac electrophysiology professionals through Monte Carlo simulation, evaluating radiological protection criteria.
The work was developed by creating a scenario in the code computational MCNPX 2.7.0 in the same clinical configuration of the procedure, considering a typical adult patient and worker. The patient was represented by a ICRP 110 references a male anthropomorphic phantom. The parameters used in the simulation were: protocol, FOV, incidence angle, and X-ray beam spectrum.
Scenarios with and without the use of lead protection by the team were considered. Of the set of organs evaluated, the most exposed were the liver, gonads, thyroid, and bladder. The annual effective dose of the electrophysiologist was 7.423 mSv, and when protection was used, it was 0.061 mSv, a reduction of 81.78% radiation received by the professional.
It was possible to estimate the dose received by the electrophysiology team through Monte Carlo Simulation, validating the importance of adopting good radiological protection practices during the procedure, such as the use of protection plumbiferous.

ID_244

Title of the abstract: Barite Concrete Formulations for Efficient Shielding of Ionizing Radiation in Radiotherapy: Reusing Solid Waste for Sustainable Building Practices
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Abstract: In order to ensure the protection of individuals against ionizing radiation used in radiotherapy, several materials are employed in the shielding process, including barium sulfate (barite), which is known to have a good ability to attenuate photon beams at different energies. In this study, three barite concrete formulations (T.REF (reference), T.10%SA (with 10% replacement of Portland cement by silica fume) and T.10%CV (with 10% replacement of Portland cement by fly ash) are proposed to evaluate the effects on shielding ionizing radiation generated by a linear accelerator. The concrete samples were characterized in terms of density and axial compressive strength, and the shielding efficacy was evaluated by measuring the attenuation of primary beam radiation for maximum acceleration voltages of 6 MV and 10 MV as a function of thickness of the specimens. All the barite concretes were classified as normal with respect to density and met the structural and severity criteria of the medium in terms of compressive strength. Regarding the shielding of ionizing radiation, the barite concrete T.10%CV showed a reduction of 80.91% in the thickness of radiation therapy room walls compared to traditional concrete, for an attenuation of 95% of incident radiation. This concrete, composed of barite and also fly ash, a residue from coal combustion in thermal power plants, also proposes a method of reusing a solid waste, reducing the amount of waste sent to landfills. The barite concretes T.REF and T.10%SA also proved suitable for use in radiation therapy room barriers, although they showed lower attenuation than T.10%CV

ID_245

Title of the abstract: EFFECTS OF ELETROMAGNETIC RADIATION OF DIFFERENT ENERGIES IN BLUE QUARTZ - THERMOLUMINESCENCE DOSIMETRY

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Abstract: Quartz, which is the second most abundant mineral in the continental crust, is found in igneous, metamorphic and sedimentary rocks, and it belongs to the silica group, which has SiO_2 as its basic composition. The quartz phase presents modifications of the α and β types, being that α-quartz is stable for temperatures below 573 °C and crystallizes trigonally, and β-quartz system is stable in between 573 °C – 870 °C and crystallizes in a hexagonal structure. Its symmetry class is 32, which means it presents structural enantiomorphism. The difference in electronegativity between oxygen and silicon creates covalent bonding (40%) as well as ionic bonding (60%). The objective of this present work is to study the dosimetric properties of blue quartz such as its reproducibility, repeatability, linearity, signal fading, and energy dependence, for its possible use as a thermoluminescent dosimeter. The natural blue quartz, purchased at the LEGEP stone store in São Paulo, was pulverized with a mortar and pestle, both made of high-hardness ceramic; the sample was then sieved to select for grains measured between 80 μm and 180 μm in diameter, and grains smaller than 80 μm were used for X-ray diffraction and X-ray fluorescence. In the powder sample, measurements were done of the thermoluminescence readings of the sample in natura, as well as of the dependence of the dose to the TL response.

The blue quartz grains were sensitized using two methods: heat treatment and pre-dosing, to thus obtain the best combination of synthesis temperature, sensitization dose and activation temperature. The TL glow curve of the quartz in natura shows the TL peaks, the first being around 200 °C and the second at around 325 °C. The 325 °C peak is widely used in dating works (CANO, et al., 2015; VICHAIDIS and SAEINGJAEW, 2022; GU, et al., 2021). The selected grains were separated into packages, and irradiated with increasing doses of gamma radiation from 50 Gy to 3 kGy, and, in the emission curves obtained, it is possible to observe the TL peaks around 121 °C, 169 °C, 203 °C, 257 °C and 342 °C. Peaks below 190 °C are considered unstable in dosimetry because they disappear within a few hours, and peaks above 190 °C are considered stable peaks. For the thermal treatment method, blue quartz grains were thermally treated at 400 °C, 600 °C, 800 °C, 1000 °C and 1200 °C, followed by a rapid cooling, and then irradiated with a dose of 1 Gy. It was observed that, for the temperature of 600 °C, the emission curve presents two peaks, at 150 °C and 350 °C; for 800 °C, peaks appear around 140 °C, 204 °C and 340 °C; for the thermal treatment at 1000 °C, 2 peaks can be observed at 140 °C and 200 °C, and the peak of 340 °C is not observed; and for the treatment of 1200 °C, the TL emission curve presents a well-defined peak around 204 °C.

For the pre-dosing method, eight different pre-doses between 50 Gy and 20 kGy were tested, and it was found that the blue quartz sample with a pre-dose of 500 kGy has the highest TL intensity value, and, beyond that dose, the response begins to decrease. Thus, the pre-dose of 500 Gy was chosen for testing different values of thermal activation, in which the quartz grains, after being irradiated with the pre-dose of 500 Gy, were thermally treated with temperatures of 300 °C, 400 °C , 500 °C, 550 °C, 600 °C, and 650 °C for one hour, and then irradiated with a test dose of 1 Gy. It was observed that, for 550°C, the TL intensity is maximum, and, beyond that temperature, the TL intensity begins to decrease, due to thermal deactivation occurring.

Blue quartz pellets have thermoluminescent properties that make them suitable for gamma radiation dosimetry. The TL emission glow curve of the material was reproduced with the GlowFit program, showing that the curve is composed of six peaks. The linearity of the TL response was proven for up to 5 Gy, and, beyond that, it then presents a sublinear behavior. The minimum detectable dose for the pellets studied is 2.34 mGy, and the TL peak at 221 °C has less than 5 % fading, indicating that this peak can be used for dosimetry. In conclusion, blue quartz pellets can be used as passive dosimeters in gamma radiation applications, and their thermoluminescent properties have been well studied and characterized.

ID_246

Title of the abstract: Long term properties of feldspar samples studied by pulsed OSL

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Abstract: Feldspars are widespread in the Earth's crust. These minerals exhibit good luminescent properties after exposure to ionizing radiation. For that reason, feldspars are commonly used to date Quaternary sediments.

It is well known that feldspars are very complex materials containing many different defects that may be irregularly distributed in the bulk. Even a continuous energy distribution of traps and recombination centers is considered. Freshly irradiated samples exhibit significant fading of the optically stimulated luminescence (OSL) which is partially related to redistribution of trapped charge carriers.

The paper presents various OSL properties of feldspar samples measured after different storage times from irradiation. The data were compared to long term pulsed OSL data collected during several hours of continuous measurements. The measurements were performed using Helios III OSL reader. The direct OSL measurements were compared to long term pulsed OSL using a special numerical algorithm. It was shown that this type of measurements can be used to simplify determination of several characteristic OSL parameters including fading and regeneration lifetimes.

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Title of the abstract: Increased luminescence of CaF2 OSL detectors through the deposition of metallic nanoparticles.

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Abstract: The presence of nanoparticles (NPs) deposited on the surface of OSL dosimeters can affect their luminescent efficiency. Studies published in the literature have shown that an increase in OSL intensity can be obtained by depositing metallic nanoparticles (M-NPs) on the surface of these OSL detectors, this is due to the effect of localized surface plasmon resonance (LPRS). Optical phenomenon that occurs when M-NPs are illuminated by light, when light interacts with NPs, the photon energy is unlimited for the electrons on the metal surface, generating collective oscillations of the electrons. Such oscillations generate an electromagnetic field around the NPs that is highly dependent on the geometry, size and material of the