

Dosimetric Characterization of Brazilian Natural Quartz Using the Thermally Stimulated Exoelectron Emission

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Body of Abstract: The thermally stimulated exoelectron emission (TSEE) is considered to be effective for the detection of low penetrating radiation, such as alpha and beta particles and low energy X rays, due to the shallow surface within which exoelectrons originate, without loss of sensitivity. Since the TSEE phenomenon occurs on the surface of an insulator or semiconductor, it provides dose information from thin layers in these materials. The most common materials used for this technique are: Aluminum Oxide, Beryllium Oxide and Lithium Fluoride. In this work, the properties of quartz (rose and white) and amethyst, the purple variety of alpha quartz sintered pellets (6.0mm diameter and 0,8mm thickness) were investigated using the TSEE technique to verify the usefulness of these materials for alpha, beta and low energy X rays detection. Quartz has received considerable attention in recent years from the point of view of its properties and technological applications. The dosimetric properties, as glow curves, response reproducibility and calibration curves, were determined using the secondary standard systems of beta and alpha sources from the Calibration Laboratory of IPEN with sources of Sr-90 + Y-90, Pu-239, Am-241 and Cm-244, and an X ray system with a Rigaku Denki generator, model Geigerflex, with a Philips tube (60 kV). The readout of the samples was made using a 2pi windowless proportional counter, with hemispherical volume, and using P-10 gas flow and an operating voltage of 2.0kV, developed and manufactured at IPEN. A temperature programmer that provides linear heating of the sample forms the heating system. The main glow peak of these materials occurs at about 190°C. The obtained results show the feasibility of use of quartz sintered pellets using the thermally stimulated exoelectron emission technique.