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Characteristics of CsI(Tl) Scintillators with Different Tl⁺ Concentrations under Electron and Alpha Particles Excitation

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CsI(Tl) scintillators are often used as a particle identification detector for heavy ionizing particles by using a pulse shape difference for several ionization densities. The Tl⁺ concentration of the CsI (Tl) scintillator reported in references for particle identification has been usually available commercially, and is nominally around 10⁻³ mole, which was determined for gamma ray excitation for nearly half a century ago. However, this concentration may be different for particles with different ionization densities other than electrons. In order to obtain a better performance for the radiation detector, it is necessary to study the Tl concentration dependence for scintillation characteristics. This paper reports the emission spectra, pulse height and decay curves of CsI(Tl) crystals with Tl⁺ concentration ranging from 10⁻⁶ to 10⁻² under electron and alpha excitations. Larger pulse heights were observed for a higher ionization density of alpha particle compared with those of electron excitations. Decay curves under electron and alpha particle excitations were compared with the decay curve under pulsed UV excitation.

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RADIOACTIVITY OF POWDERED MILK PRODUCED AT LONDRINA, PR, BRAZIL

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The measurement of radioactive lines in the environment and in food is of fundamental importance for controlling the radiation levels which one man is exposed direct or indirectly. This work deals with the measurement of radioactive lines in powdered milk, with high resolution gamma spectrometry, using a HPGe detector with relative efficiency of 10%, coupled to a standard electronic nuclear chain and a multichannel card of 8192 channels. Preliminary measurements were accomplished to define the kind of the system shield, the geometry of the sample recipient, the size of the sampling and the correction of self absorption. Two kinds of powdered milk produced at Londrina, state of Paraná, southern of Brazil, were analyzed: Integral Powdered Milk Cativa and the Integral Powdered Milk Polly. The samples were properly accommodated in a Marinelli beaker of 2.1 l, sealed and kept by 40 days. The counting time of each measurement was two days. It was possible to identify the radionuclides 40K, 137Cs and 232Th (from 208Tl), whose activities were calculated according to the International Atomic Energy Agency norms. The detector efficiency was measured employing calibrated samples, prepared with IAEA certificated standards mixed with powdered milk, with same geometry of the samples. The results are presented in the Table 1. Tukey's average comparison test was used to check the repeatability of the measurements and the absence of significant systematic deviation. It can be concluded that, in general, the implemented technique showed good results when compared with other works (Table 2 shows a comparison with one work of the literature). In other hand, the Cativa and Polly milk presented normal radioactivity levels, with the radionuclides activity below the maximum level permitted by IAEA and CNEN (National Nuclear Energy Center), in this way the milk can be normally consumed, without any kind of restriction.

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A Camac Data Acquisition System Based on PC-Linux

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A multi-parametric data acquisition system for Nuclear Physics experiments using camac instrumentation on a pc computer with the Linux operating system is described. The front-end camac instrumentation is interfaced to the ISA bus of a pc computer by a CAEN c111a camac controller and the A151-A turbo board. The main characteristic of this controller and its interface to the pc is that the allowance of very fast data transfer to the computer using only two 16-bit io-port operations. The driver we developed for this interface includes also a set of