THE GROWTH AND SCINTILLATION CHARACTERISTICS OF LITHIUM DOPED CsI CRYSTALS

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Inorganic scintillators play an important role in the detection and spectroscopy of gamma and X-rays, as well as in neutrons and charged particles. For a variety of applications, new inorganic scintillation materials are being studied. New scintillation detector applications arise continuously and the interest in the introduction of new fast scintillators becomes relevant. Scintillation crystals based on cesium iodide (CsI) have relatively low hygroscope, easy handling and low cost, features that favor their use as radiation detectors. In this work, lithium doped CsI crystals were grown using the vertical Bridgman technique. In this technique, the charge is maintained at high temperature for 10 h to for the material melting and complete reaction. The temperature gradient 21° C/cm and 1 mm/h descending velocity are chosen as technique parameters. After growth is finished, the furnace is cooled at a rate of 20° C/h to room temperature. The concentration of the lithium doping element (Li) studied was 10^{-3} M. Analyses were carried out to evaluate the scintillator developed concerning two responses: a) to the gamma radiation, in the energy range of 350 keV to 1330 keV and b) to neutron from AmBe source, with energy range of 1MeV to 12 MeV. T.S. Korolevaa et al [1] describe in their paper about new scintillation materials, for registration of gamma-rays, X-rays, neutrons and neutrinos. One of these materials is ^{6}Li. Lithium can capture neutrons without gamma-ray emission and, thus, reducing the back-ground. The neutron detection reaction is $^{6}Li(n,\alpha)^{3}H$ with a thermal neutron cross section that 940 barns. In this paper we investigated the feasibility of the CsI:Li crystal as a gamma ray and neutron detector which can be used for monitoring, due to the fact that in our work environment we have two nuclear research reactors, calibration systems and radioisotope production.

1. *Koroleva T S, Shulgin B V, Pedrini Ch, Ivanov V Yu, Raikov D V, Tcherepanov A N (2005). New scintillation materials and scintiblocs for neutron and γ-rays registration. Nucl Instrum Methods Phys Res 537: 415-423*