Study and development of neutron detectors using doped CsI crystals

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In the development of nuclear radiation detectors one must take into consideration the process of interaction of the radiation under study with matter.

In the case of neutron detectors it must be considered that the detection of neutrons is not trivial in view of the lack of charges of these particles and the peculiarity of their interactions with matter. Another difficulty in the detection of neutrons consists in the discrimination of the electronic impulses generated by the neutrons of those generated by other radiations, almost always present. The main propositions of neutron-sensitive detectors consist of gaseous detectors, scintillators and semiconductors. These detectors intrinsically are not sensitive to neutrons, so they need a radiation converter based on nuclear reactions of the type: Neutron + Converter -> Detectable radiation.

Some reactions with neutrons are more used, such as: ^{10}B (n, α), ^{6}Li (n, α) and ^{3}He (n, p).

Neutron-scintillation crystal are being the object of active research in several research centers and having their implementations in several applications.

The development of new radiation detectors using scintillation crystals, which increases response speed, dose and energy accuracy and, at the same time, the feasibility of simplifying and reducing costs in the production process is always necessary.

In the CTR-IPEN laboratory, pure and doped CsI crystals were grown using the Bridgman technique.

This work shows the obtained results using doped CsI scintillator with the converters: Br, Pb, Tl, Li as neutron detectors.