

§2. Development of a Dose Measurement Method in n-X(γ) Mixed Field

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The CdZnTe detector (CZT) is a semiconductor detector which can be used in usual temperature. Compared with the CdTe detector, the CZT has good sensitivity for high energy gamma-rays. The aim of this work is to obtain data of CZT response characteristic in thermal neutron field. Using the data, we discuss application of CZT for monitoring gamma rays in neutron field, or possibility for neutron detector.

The CZT was placed in the D₂O facility of KUR. The position was 200 cm from bismuth surface, 88 cm height above the floor. The reactor was operated 0.1, 0.3, 1 kW. As shown in Fig. 1, the measurements were done in the three manners of setting, (1) just CZT, (2) covered with 2mm thick cadmium plate, (3) enclosed by 65mm thick polyethylene block.

Figure 2 shows the result. The energy spectrum of gamma rays is obtained in each irradiated condition. (1) just CZT; Two sharp peaks were found those are at around 450keV(340ch.) and 550keV(410ch.). These two peaks may be caused by activation of detector itself, for instance, $^{68}\text{Zn}(n, \gamma)^{69\text{m}}\text{Zn}$ 439keV $^{116}\text{Cd}(n, \gamma)^{117\text{m}}\text{Cd}$ 553keV. (2) covered with cadmium plate; The cadmium plate cut off low

energy neutron. The counts were not increased from that of just CZT above 140 channel. On the other hand, the counts below 140 ch. is smaller than just CZT. It means that the effect of low energy neutron less than Cd cut off energy appears in low energy range gamma rays. (3) enclosed by polyethylene block; The polyethylene block makes neutrons thermalized and shielded. Total counts was decreased. Above 140 ch. counts are small in a constant ratio than just CZT. Below 140 ch. counts go up decreasing channel. Further experiment and discussion bring the available monitoring system using CZT for neutron and gamma rays mixed fields.

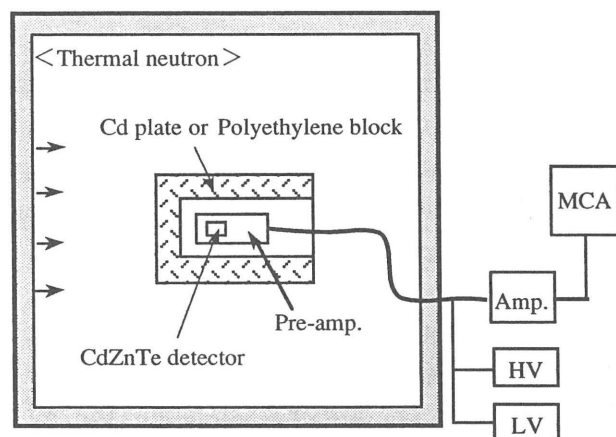


Fig. 1 Experimental arrangement in D₂O facility

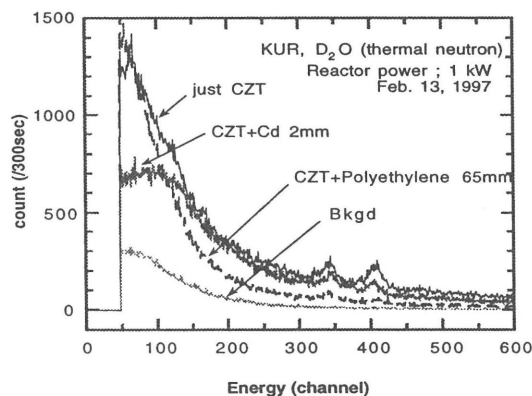


Fig. 2 Energy spectrum of the output from CdZnTe detector in D₂O facility of KUR.