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ELETRONIC RESPONSE OF PHOTODIODE COUPLED TO A BORON THIN FILM

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A portable thermal neutron detector is proposed using a silicon photodiode coupled to a boron thin film. The aim of this work was to verify the effect in the electronic response of this specific photodiode due to boron deposition, since the direct deposition of boron in the semiconductor surface could affect its electrical properties specifically the p-type layer that affects directly the depletion region of the semiconductor reducing the neutron detector efficiency count. Three boron depositions with different thickness were performed in the photodiode (S3590-09) surface by pulsed laser deposition and the photodiode was characterized, before and after the deposition process, using a radioactive americium source. Energy spectra were used to verify the electronic response of the photodiode, due to the fact that it is possible to relate it to the photopeak pulse height and resolution. Spectra from the photodiode without and with boron film deposition were compared and a standard photodiode (S3590-04) that had the electronic signal conserved was used as reference to the pulse height for electronics adjustments. The photopeak energy resolution for the photodiode without boron layer was 10.26%. For the photodiode with boron deposition at different thicknesses, the resolution was: 7.64% (0.14 μm), 7.30% (0.44 μm) and 6.80% (0.63 μm). From these results it is possible to evaluate that there was not any degradation in the silicon photodiode.

This work was presented at International Nuclear Atomic Conference – INAC 2017 (poster)