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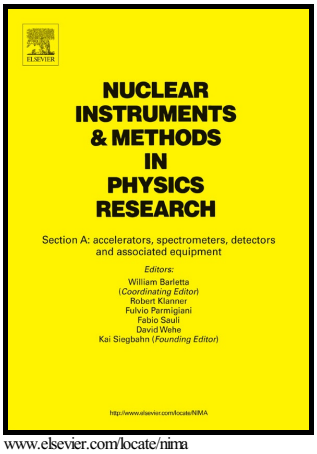

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ABSTRACT

Nowotny-Juza compounds continue to be explored as candidates for solid-state neutron detectors. Such a device would have greater efficiency, in a compact form, than present day gas-filled ^{3}He and $^{10}BF_3$ detectors. The $^{6}Li(n,t)^{4}He$ reaction yields a total Q-value of 4.78 MeV, larger than ^{10}B, an energy easily identified above background radiations. Hence, devices fabricated from semiconductor compounds having either natural Li (nominally 7.5% ^{6}Li) or enriched ^{6}Li (usually 95% ^{6}Li) as constituent atoms may provide a material for compact high efficiency neutron detectors. Starting material was synthesized by preparing equimolar portions of Li, Zn, and As sealed under vacuum (10^{-6} Torr) in quartz ampoules lined with boron nitride and subsequently reacted in a compounding furnace [1]. The raw synthesized material indicated the presence high impurity levels (material and electrical property characterizations). A static vacuum sublimation in quartz was performed to help purify the synthesized material [2, 3]. Bulk crystalline samples were grown from the purified material [4, 5]. Samples were cut using a diamond wire saw, and processed into devices. Bulk resistivity was determined from I-V curve measurements, ranging from 10^{6} – 10^{11} Ω cm. Devices were characterized for sensitivity to 5.48 MeV alpha particles, 337nm laser light, and neutron sensitivity in a thermal neutron diffracted beam at the Kansas State University TRIGA Mark II nuclear reactor. Thermal neutron reaction product charge induction was measured with a LiZnP device, and the reaction product spectral response was observed.

Keywords:
Lithium compounds; Radiation; Neutron Detector; Semiconducting ternary compounds

INTRODUCTION