Contribution ID: 109

Type: Poster presentation

Scaling and scintillation performance of TLYC:Ce

Wednesday 20 September 2017 10:16 (1 minute)

Crystalline scintillators with high Z numbers, good energy resolution, and the ability to detect neutrons are highly attractive for threat discrimination and special nuclear materials identification. Traditional scintillators NaI and CsI have effective Z numbers of 50 and 54. However, they do not offer neutron detection. CLYC (Cs2LiYCl6:Ce) scintillator offers gamma energy resolution near 4%, thermal neutron detection when enriched with 6Li, and fast neutron detection when enriched with 7Li [1]. Being a cubic system, it is also relatively easy to grow, therefore its production has scaled rapidly over the last three years, both in terms of size and availability. But at Z=45, and relatively low density of 3.3 g/cc, more material is needed to absorb gamma radiation, as compared to NaI or CsI.

In this paper, we will discuss scaled growth and scintillation performance - of a relatively new scintillator, TLYC (Tl2LiYCl6:Ce), first presented by Kim et. al at SCINT 2015 [2] and later discussed by Hawrami et. al [3]. With cesium replaced by thallium, the material becomes 33% more dense (4.58 g/cc) and the Z number increases from 45 to 69. With higher density and effective Z, less TLYC is required to achieve the equivalent stopping power compare to CLYC. Our preliminary results with a small 10 mm in diameter and 20 mm long crystal show 4.1% energy resolution, a brightness of 22,500 ph/MeV at 662 keV, and FOM of 1.87 for thermal neutron detection. In the paper, we will present results of TLYC enriched with 6Li or 7Li to provide dual or tri-mode (γ /n) detection through the well-known pulse shape discrimination technique.

References:

- 1. Inorganic thermal-neutron scintillators, C.W.E. van Eijk, A. Bessiere, P. Dorenbos, Nuclear Instruments and Methods in Physics Research Section A 529 (2004) 260.
- 2. Tl2LiYCl6 (Ce3+): New Tl-Based Elpasolite Scintillation Material, H. Kim1, G. Rooh, S. Kim, H. Park, SCINT 2015, Berkeley CA, USA.
- 3. Tl2LiYCl6:Ce: A New Elpasolite Scintillator, R. Hawrami, E. Ariesanti, L. Soundara-Pandian, J. Glodo, and K. S. Shah, IEEE Transactions on Nuclear Science 63-6 (2016) 2838.

Has accepted

Authors: KHODYUK, Ivan (CapeSym, Inc); SWIDER, Stacy (CapeSym, Inc.); Dr MOTAKEF, Shariar (CapeSym, Inc.)

Presenter: KHODYUK, Ivan (CapeSym, Inc)

Session Classification: Poster Session 2

Track Classification: P3_novel materials