

Developing Fast Scintillators for Neutron Detection

Qi Wu^{2,3}, Xun Sheng Zhou^{1,2}, Lu Yao^{1,2,3}, Binqing Zhao^{1,2}, and Cai Lin Wang^{1,2,3}

¹*Dongguan Institute of Materials Science and Technology, CAS, Dongguan, Guangdong 523808, China*

²*Songshan Lake Materials Laboratory, Dongguan, Guangdong 523808, China*

³*Quantum Science Center of Guangdong-Hongkong-Macao Greater Bay Area, Shenzhen, Guangdong 518045, China*

Corresponding Author Email: clwang@dimst.ac.cn

Fast scintillators for neutron detection in the energy range of 25 meV-1000 GeV are needed for applications in spallation neutron sources, high-energy physics, security check, electronic reliability tests, and environment monitoring. To satisfy such needs, we have researched three fast scintillators with decay time shorter than 10 ns under the irradiation of a moderated ²⁵²Cf thermal neutron source: i). a CaF₂/⁶LiF eutectic composite co-doped with 5% Pr³⁺ and 0.5% Eu²⁺, which has a decay lifetime of 4 ns and a light output of about 1,000 ph/n; ii). an undoped Cs₂AgI₃/⁶LiF /PMMA composite, which has an average decay lifetime of about 6 ns and a light output of about 1,000 ph/n; iii). a Li-6 containing CuI-based cluster crystal, which has an average decay lifetime of about 3 ns and a light output higher than the commercial GS20 neutron scintillator. We will report the fabrication processes, optical test, radiation-induced luminescence, and radiation reliability test results of these scintillators. Their potentials in the time-of-flight (TOF) measurements for neutron energy spectra will also be demonstrated.

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