Polysiloxane Scintillators of Neutron and Gamma Ray Discrimination

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Abstract: Traditionally, plastic scintillators are thermoplastic matrices, such as polystyrene or poly(vinyl toluene), doped with fluorescent molecules. These thermoplastic scintillators can discriminate between neutrons and gamma rays via pulse shape discrimination when the fluorescent dopant is added in high concentrations (>20wt%). While PSD capable plastic scintillators have been extensively studied and commercialized, they are limited to applications suitable for thermoplastics. For applications requiring flexibility, elastomeric scintillators may offer an alternative to the traditional PVT scintillators. We report polysiloxane based scintillators capable of PSD at reduced dopant concentrations (<5wt%). Two dopants, commercially available 2,5 diphenyloxazole (PPO) and 9,9-dimethyl-2-phenyl-9H-fluorene (PhF) were explored as primary dopants. A 5 wt% PPO had a FoM of 1.33 ± 0.03 at 450 keVee and light yield of 94% relative to EJ-299-33. The 5 wt% PhF-polysiloxane sample had a lower FoM 1.09 ± 0.03 at 450 keVee but a higher light yield, 144% of EJ-299-33. With comparable FoM and LY to EJ-299-33, these polysiloxane scintillators demonstrate the potential for an elastomeric PSD capable plastic scintillator.