Progress in Polysiloxane-based Scintillators

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Abstract

In recent years, new scintillator materials have been developed to address long-standing radiation detection challenges, such as imaging of thermal and fast neutrons in the presence of gammas. Polysiloxane-based scintillators have demonstrated good pulse shape discrimination (PSD) between fast neutrons and gammas with figures of merit (FOMs) exceeding the 1.27 threshold for efficient discrimination. Recently, by incorporating boron-10 enriched molecules into these scintillators, thermal neutron sensitivity was demonstrated while retaining good discrimination between fast neutrons and gammas. Here, polysiloxane scintillators were doped with the B10-enriched molecules, evaluated for their sensitivity to thermal neutrons, and assembled into an array to test three particle imaging (thermal neutron, fast neutron, and gammas) using machine learning methods to discriminate thermal neutron interactions. In this work, the current progress in polysiloxane scintillators is detailed and current developments on boron-doped scintillators are shown.