

Performance of extruded polystyrene-based plastic scintillators

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In cooperation with NUVIA a.s., we have developed polystyrene-based plastic scintillators produced using an extrusion technique as an alternative to the standard bulk polymerization of styrene. While the conventional production at NUVIA relies on polymerization with p-terphenyl (pTP) and POPOP fluorescent additives, the extrusion approach employs pre-doped polystyrene pellets processed in an extruder. The extrusion parameters were systematically tuned to optimize the scintillator production.

Several extruder head profiles were tested, resulting in scintillators of different geometries, and various concentrations of pTP and POPOP in the polystyrene matrix were investigated to optimize the optical response. The scintillation performance was characterized using a unique tunable electron spectrometer providing a monoenergetic electron beam in the energy range from 200 keV to 1.4 MeV [1]. The measured characteristics include light output and light attenuation length, which are key parameters for detector applications.

The results are compared with those obtained from scintillators produced by the standard polymerization technique. This contribution presents a direct comparison of the optical performance of extruded and polymerized polystyrene-based scintillators and demonstrates the potential of extrusion as a flexible and scalable production method for plastic scintillation detectors.

[1] C. Marquet et al., High energy resolution electron beam spectrometer in the MeV range, *Journal of Instrumentation* **10** (2015) P09008.

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