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Mixed Material Scintillator Systems[1] XIANYI ZHANG, JASON BRODSKY, ANDREW MABE, ELAINE LEE, DOMINIQUE HENRY PORCINCULAR, Lawrence Livermore National Laboratory — We present two conceptional organic scintillator detectors that utilize additive manufacture (3D-printing) of mixed materials to enable new capabilities. Both new scintillators use fine structures of different colored dyes to harness the wavelength of scintillation light to encode additional information in radiation measurements. The first detector uses 3D-printed periodic dye microstructures to encode particle tracking information, allowing for directional neutron detection and gamma/neutron discrimination. Another type of scintillator uses a dye gradient to indicate the position of radiation along the gradient. Outstanding performances of these new scintillators in particle identification, directionality and spectroscopy measurements, as well as particle position reconstruction, have been demonstrated through simulation. A scintillating polysiloxane-based printing feedstock has also been developed to enable prototyping of these detector designs.

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