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Characterization of a ^{6}Li-loaded organic liquid scintillator for fast neutron spectrometry C.D. BASS, C.R. HEIMBACH, J.S. NICO, NIST, E.J. BEISE, H. BREUER, D. ERWIN, T. LANGFORD, A. RODRIGUES, University of Maryland — Fast neutrons induced by natural radioactivity and cosmic rays are important sources of background for low-background searches of dark matter, neutrinoless double beta decay, and solar neutrinos. One method for performing fast neutron spectroscopy involves a capture-gated coincidence between a fast neutron that thermalizes through elastic scattering within an organic scintillator and its subsequent capture on a nuclide having a high thermal neutron capture cross section. Thermalization within an organic scintillator occurs within a few ns, but the neutron capture time is typically of order 10s to 100s of μs. A capture signal preceded by a thermalization signal within a characteristic time can be used to select those fast neutrons that have deposited all of their kinetic energy into the scintillator, and the thermalization signal can provide spectroscopic information. We report on a number of measurements performed to characterize the properties of an organic liquid scintillator based on di-isopropyl naphthalene and loaded with ^{6}Li. This work has been carried out within a joint UMd and NIST project to develop a fast neutron spectrometer suitable for use in a deep underground, low-background laboratory. In particular, we report on measurements of optical properties, light yield, and fast neutron response.

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