Scintillator design for CDMS

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Using an RTC XP 2262 B photomultiplier tube (PMT), we analyzed the effectiveness of 2,5-diphenyloxazole (PPO), 9,10-diphenylanthracene (DPA), and trimethyl borate (TMB) as possible constituents for the Cryogenic Dark Matter Search (CDMS) scintillation development. These materials were selected as candidates since they all have properties, which should work to increase the light yield, which is useful for identifying and separating mono energetic particles. Our tests allowed us to compare the efficiencies of these materials and maximize the effective light yield we received. We also used Monte Carlo simulations to analyze these scintillator designs to determine whether the results we received were realistically feasible or whether they were anomalies that we were observing due to errors in the data acquisition system, experimental setup, or genroot algorithms used to calculate the light yield. Results indicated that adding some of each of the PPO or POPOP, DPA, and TMB did in fact increase the light yield of our scintillators. However, the effectiveness of the scintillator to produce light did not continue to increase as the concentrations of each chemical was increased in the scintillator designs; instead, there was a peak percentage of each chemical which resulted in maximum light yield for the scintillators.

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