

Photodegradation Mechanisms of Tetraphenyl Butadiene Coatings for Liquid Argon Detectors

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We report on studies of degradation mechanisms of tetraphenyl butadiene (TPB) coatings of the type used in neutrino and dark matter liquid argon experiments. Using gas chromatography coupled to mass spectrometry we have detected the ultraviolet-blocking impurity benzophenone. We monitored the drop in performance and increase of benzophenone concentration in TPB plates with exposure to ultraviolet (UV) light, and demonstrate the correlation between these two variables. We show promising results obtained by adding a free radical inhibiting stabilizing compound, which improves the initial performance of LBNE style light-guide coatings by up to 20% and significantly improves their UV stability.

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