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Gd-PMMA: a novel neutron tagging technology for low background detectors.

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Low-background detectors, such as those used in direct dark matter searches, require high-efficient neutron veto systems to suppress nuclear recoil backgrounds. Gadolinium-doped polymethyl methacrylate (Gd-PMMA) has emerged as a promising solid-state neutron tagging material, combining high hydrogen content for neutron moderation with gadolinium's strong thermal neutron capture cross-section, followed by the emission of high-energy gamma rays. These gammas can be effectively detected by both the surrounding veto buffer of the detector, e.g. liquid argon or liquid xenon. A novel Gd-PMMA material based on gadolinium methacrylate has been developed and validated for large-scale mass production. This material will be implemented for the first time in the DarkSide-20k experiment, a liquid argon-based direct dark matter search. This poster will present the development process of Gd-PMMA, including a dedicated annealing procedure designed to release residual stress for cryogenic applications. Measures taken to control radiopurity during production will also be discussed.

Collaboration you are representing

DarkSide

Authors: CHEN, Lei (IHEP, CAS); WANG, Yi (IHEP, CAS)

Presenter: CHEN, Lei (IHEP, CAS)

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