

Development of novel scintillating materials with the DIANA project

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The DIANA (Development of a sustainable Amorphous Novel scintillAtor) project aims to develop a novel hybrid scintillator that combines the advantages of organic and inorganic scintillators by leveraging scintillating crystal fragments. This dense, optically continuous material will be scalable to large dimensions, easily machinable into desired shapes, and economically competitive. The crystal fragments, sourced from production residues or damaged scintillators, will be embedded in an amorphous matrix of glass or polymer.

This hybrid scintillator will enable the construction of detectors with diverse applications, such as high-energy physics experiments and veto systems, offering economic benefits and promoting the reuse of materials. The amorphous matrix will be tailored to achieve the required density and optical properties, ensuring efficient optical coupling with the scintillating fragments.

Polymer-based matrices will be produced at room temperature by mixing the fragments with liquid resins prior to polymerization. Glass-based matrices will be fabricated by heating a mixture of glass and fragments to sintering temperatures, resulting in an optically and mechanically continuous material after cooling.

Over the project's two-year span, the optimal methodology for producing homogeneous, defect-free samples will be refined. Prototypes will be characterized in terms of scintillation performance, light attenuation, and radiation hardness, including dedicated beam tests.

Ultimately, the DIANA project aims to deliver a scintillator with high performance and competitive costs while advancing eco-friendly technologies. The reuse of crystal fragments addresses the limited industrial recycling options currently available, as repeated processing often degrades their optical properties.

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