

Multi purpose detector using high light yield CaI2 crystal

Detection of dark matter and double beta decay are ones of the most important issues in the present astroparticle physics and reveal the history of our universe. Inorganic scintillator detector, such as NaI(Tl) scintillator, is one of the major techniques for direct dark matter search. In addition, inorganic scintillator including double beta decay isotope can be used for double beta decay experiment.

We have been developing calcium iodide (CaI₂) scintillator which has more than twice larger light yield compared with NaI(Tl) scintillator for the purpose of future dark matter and double beta decay experiment. Although CaI₂ has very good properties as a scintillator, it is not commonly used due to its deliquescence and cleavability. In May 2016, we have grown a one inch size CaI₂ crystal using Bridgman crystallization furnace in Institute for Materials Research, Tohoku University. Very high light output of 106,000 photon/MeV, energy resolution of 3.2% @662keV, and scintillation decay time of 834ns (84%) 1460ns (16%) were obtained. This light output is 2.7 times larger than NaI(Tl) scintillator which is most commonly used inorganic scintillator. In this presentation, we discuss results of performance evaluation for CaI₂ scintillator.

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