

Reduction of the radioactive impurities in NaI powder by recrystallization method

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The COSINE project is aimed at direct detection of dark matter experiment[1]. WIMPs(Weakly Interacting Massive Particles) are one of the most attractive candidates of dark matter[2, 3] but, only DAMA/LIBRA experiment has claimed the detection of a WIMPs[4]. To confirm or exclude the DAMA/LIBRA's modulation results, COSINE is going to achieve ultra-low background and lower energy threshold than DAMA/LIBRA experiment. The NaI scintillating crystal is very suitable material for dark matter searching. In this experiment, radioactive impurities make noise on the peaks and high background. To manufacture the ultra-low background crystal, this presentation will be focused on purification of the NaI powder.

NaI powder was purified by fractional recrystallization from water. The concentration of K, Pb, Th, U and other impurities was measured by ICP-MS. As a result, the recrystallization effectively reduced the concentration of radioactive impurities such as K, Pb, Sr, Ba, Th, and U. Furthermore, based on these experimental methods and results, pilot scale of process were designed and manufactured for COSINE project. It is a recrystallization purify system that can purify 70 kg of NaI powder at one cycle and it takes 3~4 days from purification to drying. This process and result also will be presented.

References:

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