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Laser isotope separation of 48Ca for the study of neutrinoless double beta decay and the CANDLES project

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Neutrinoless double beta decay is a powerful method for verifying Majorana neutrinos. ^{48}Ca is one of the best candidates because it has the largest Q-value of decay (4.27 MeV) and is the target nucleus of the CANDLES project. Although a large number of target nuclei is essential to search for the decay with higher sensitivity, there is no established mass production method for enriched ^{48}Ca isotopes. Laser isotope separation (LIS) using the deflection method offers the possibility to overcome this difficulty. We have completed proof-of-principle experiments and are developing a prototype system for mass production of ^{48}Ca by LIS. It consists of 1) a natural calcium atomic beam, 2) a laser for deflection, and 3) a enriched/depleted calcium recovery system, with 1) and 3) installed in a vacuum chamber. For long-term stable production, the following performance is being developed, 1) A well-collimated, high-efficient and intense atomic beam, 2) High intensity laser with narrow line width compared to the natural width of the transition, and 3) A system to efficiently recover enriched and depleted calcium, respectively.

The current status of these developments and an overview of the CANDLES project will be presented.

Collaboration you are representing

CANDLES

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