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Distillation and Separation of Rare Isotopes and their Applications

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We present two techniques related to the production of rare isotopes and their consequent application fields. The first is related to the Darkside Experiment that makes use of liquid argon as sensible target for dark matter detection. In order to get an ultrapure and low radioactivity target, the argon will be purified in a 350 m tall distillation column placed in the Seruci mine in Sardinia (Aria project). Such a column, currently in production, will be also able to distillate rare and very valuable isotopes as 18O, 15N, 13C used, for instance, in medical diagnosis. The second is about the 3He-4He separation via an inverse osmosis process that may take place at temperature below 2 K. It is currently in a design phase and will provide the very rare and valuable 3He isotope, used in various research fields as MRI lung screening, neutron detectors and in most of the experiments where a temperature below 1 K is required.

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