

Recent developments and on-line tests of uranium carbide targets for production of nuclides far from stability

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The capacity of uranium carbide target materials of different structure and density for production of neutron-rich and heavy neutron-deficient isotopes has been investigated at the IRIS facility (PNPI) in collaboration with Legnaro – GANIL – Orsay laboratories. The yields and release times of the species produced in the targets by the reactions induced by a 1 GeV proton beam of the PNPI synchrocyclotron have been measured. For the purpose of elaborating the most efficient and fast uranium carbide target prototype three target materials were studied: a) a high density UC target material having ceramic-like structure with a density of 11 g/cm^3 and grain dimensions of about 200 microns; b) a high density UC target material with a density of 12 g/cm^3 and grain dimensions of about 20 microns prepared by the method of powder metallurgy; c) a low density UC_x target material with a density of 3 g/cm^3 and grain dimensions of about 20 microns prepared by the ISOLDE method. The comparison of the yields and release efficiencies of Rb, Cs, Fr, In and other species produced from the investigated target materials obtained during on-line tests have been shown. The results of the on-line tests of a high density target material maintenance in the rhenium container have been presented as well. In fig. 1 the Cs isotope yields produced from a high density UC used at the IRIS facility and UC_x prepared by ISOLDE method at IRIS in collaboration with the PARRNe group from Orsay are presented. Some yield points from the ISOLDE original target are shown as well. A preliminary analysis has shown a higher yield values of short-lived Rb and Cs isotopes from a low density target. It indicates that a low density target is faster than a high density one. The following step in the target material research was the use of a high density UC target material with grain dimensions of 20 microns. The results of its on-line investigation are processed presently.

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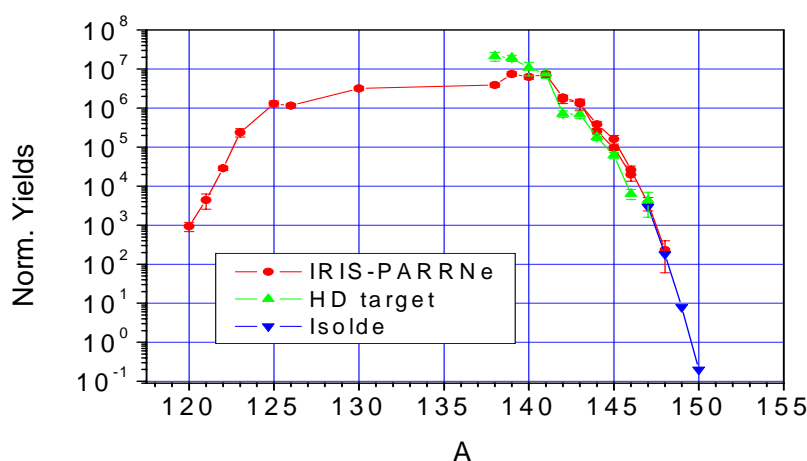


Fig. 1. Cs isotope yields produced from a high density UC used at the IRIS facility and UC_x prepared by ISOLDE method. The yields are normalized to the target thickness of 1 g/cm^2 and proton beam intensity of $0.1 \mu\text{A}$.