INTERNATIONAL CONFERENCE ON ELECTROMAGNETIC ISOTOPE SEPARATORS AND RELATED TOPICS
EMIS XVIII
CERN GENEVA / SWITZERLAND / 16 - 21 SEPTEMBER 2018

Contribution ID: **79** Type: **Poster**

The design and tests for the new CERN-ISOLDE spallation source: an integrated tungsten converter surrounded by an annular UCx target operated at 2000 ℃

Tuesday 18 September 2018 17:04 (1 minute)

Neutron-rich fission fragments are currently of great interest for the physics community. These neutron-rich fission fragments are readily available at CERN-ISOLDE using the ISOL (Isotope Separator OnLine) method. However, if produced by direct irradiation (1.4 GeV protons) of uranium carbide (UCx) targets, commonly used at ISOLDE, the desired isotopes come with very high isobaric contaminations –neutron-deficient fission fragments. Since the year 2000 at ISOLDE, a tungsten/tantalum spallation source is positioned close to the UCx target and irradiated instead. The spallation neutrons produced irradiate isotropically and interact with the target producing very high purity neutron-rich fission fragments. However, scattered protons from the bombardment of the W bar still hit the target causing the non-desired impurities.

An ISOLDE-CERN converter design optimization has been proposed before [1,2] and a simplified version has been tested under proton beam irradiation. In both, current and tested, prototype designs, the converter is put just below the target. In order to use the full solid angle of the emitted neutrons and have the highest possible neutron flux a solution is being studied where the W converter is positioned inside of the target. While this solution present large gains in both production rates and purity of the desired beams, it presents many engineering challenges. By positioning the W converter in the center of the UCx target, normally operated at 2000℃ or higher, a larger diameter target oven has to be developed. Furthermore the chemical compatibility between all the target/converter components has to be guaranteed. In addition from the 1.4 GeV pulsed proton beam –2.8 kW (1.2 GW instantaneous, 2.4 µs pulse length) –up to 700 W are deposited in the target, while submitting the W to large power depositions in very short times. Since the W converter sits inside of the target oven, it acts as an internal heat source for the target, which needs to be controlled with some precision to avoid target degradation and promote isotope release. To do such optimization studies simulations on isotope production, power deposited (FLUKA) and thermo-mechanical aspects (ANSYS) of the target oven have been done.

[1] R. Luis, et al., EPJ A 48 (2012) 90.
[2] A. Gottberg, et al., NIMB 336 (2014) 143–148.

Primary authors: Dr RAMOS, Joao Pedro (CERN); DOS SANTOS AUGUSTO, Ricardo Manuel (Ludwig Maximilians Universitat (DE)); Mr BALLAN, Michele (INFN); DIERCKX, Marc (SCK-CEN); EGORITI, Luca (TRIUMF); GOTTBERG , Alexander (TRIUMF); HOUNGBO, Donald (SCK-CEN); MARZARI, Stefano (CERN); POPESCU, Lucia (Belgian Nuclear Research Center (BE)); ROTHE, Sebastian (CERN); STORA, Thierry (CERN)

Presenter: Dr RAMOS, Joao Pedro (CERN)

Session Classification: Poster Session 2

Track Classification: Isotope production, target and ion source techniques