REC SEP @ SHE CHEM
TASCA 21
June 21 - 23, 2021
18th Workshop on
Recoil Separator for Superheavy Element Chemistry

MARGE – New Modular Robotic Gas-Jet Target System for the chemistry of SHE homologues studies

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Recently, the gas-jet transport system and target chamber developed at the University of Oslo was installed at the U-120M cyclotron beamline at the Nuclear Physics Institute (NPI) in Řež near Prague (Czech Republic). The front-end of the system is a target holder for thin metal foils from which reaction products recoil into a gas-filled chamber. The gas, seeded with KCl aerosol particles, stops the recoiling nuclides and transports them to a joint CTU-UiO-NPI laboratory that was built around the system[1]. The lab's main focus is on the chemistry of SHE homologues and on building an on-line versatile microfluidic aqueous chemistry apparatus. As a part of such developments, a new **M**odul**A**r **R**obotic **G**as-Jet Targ**E**t system (abbreviated as MARGE) was designed, constructed and successfully tested in April 2021.

The device has a modular design and consists of the following modules: carbon four-pole collimator, willemite beam monitor, and the target and gas-jet transfer chamber (GJT). The most innovative parts of MARGE are the robotic remote target-switching system (controlled by a software written in LabView) and the four-pole collimator that allows more precise beam focusing and on-line diagnostics. The remotely operated robotic two-axis arm fetches targets from a six-slot storage box. This brings significant advantage that targets can be switched without personnel having to enter the cyclotron vault, which greatly reduces personal radiation doses and wait time due to the necessary cool-down time. The inner geometry design of the gas-jet transfer chamber was based on computational fluid dynamics modeling to ensure even distribution of the gas flow across the target surface. In addition, the GJT target chamber module is designed as an individual building block. Such flexible and innovative design enables the module to be duplicated and stacked in series allowing simultaneous collection and transport of recoiling atoms from more than one target foil.

Reference

[1] BARTL P., NĚMEC M., JOHN J., OMTVEDT J.P., ŠTURSA J. *Fast Microfluidic Extraction of Sg Homologues at New Joint CTU, UiO and NPI Facility in Rez (CZE).* Book of Abstracts, p.67. TAN 19 Conference, Wilhelmshaven, Germany, 2019.