NEW OFF-LINE ION SOURCES FOR THE IGISOL FACILITY

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Two new off-line ion sources and infrastructure to operate them have been commissioned at the IGISOL (Ion Guide Isotope Separator On-Line) facility in the Accelerator Laboratory of the University of Jyväskylä. Under normal operating conditions the IGISOL set-up uses a stable ion beam from K-130 or MCC30 cyclotron impinging into a thin target foil. Reaction products are then thermalized using helium in a gas cell and extracted out with a sextupole ion guide SPIG [1]. The beam is accelerated to 30 keV and transported to an isotope separator magnet. Produced low energy radioactive beam is utilized in a range of experiments. A more detailed descreption of the IGISOL technique can be found in [2].

The IGISOL set-up has had an alternative source of low energy stable beam but the previous version of the off-line ion source increased users' exposure to radiation and could not be used during online experiments, a useful feature e.g. for atomic mass measurements at JYFLTRAP [3]. This situation has been improved with the new off-line ion sources which are of two different types, surface discharge and glow discharge ion source. First of these two is based on discharge of ions from a surface due to thermal excitation. Ion sources of this type are commercially available with a range of ionized materials. One used at the IGISOL facility ionizes a mixture of potassium, rubidium and cesium.

The second commissioned ion source is based on a glow discharge. The most simple design for this type of source is two needle-shaped electrodes pointing towards each other with buffer gas filling the volume between them. A voltage is applied between the electrodes to generate a discharge through the buffer gas. Settings needed for successful operation of this kind of ion source depend on cathode material, buffer gas pressure and geometry of the ion source itself. This kind of ion source can be used to create a beam made of elements present in the cathode and buffer gas. In this contribution, I will discuss the off-line ion source project at IGISOL and recent results from the setup.

[1] P. Karvonen, I.D. Moore, T. Sonoda, T. Kessler, H. Penttilä, K. Peräjärvi, P. Ronkanen, and J. Äystö. A sextupole ion beam guide to improve the efficiency and beam quality at IGISOL. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, 266(21):4794–4807, nov 2008.

[2] I. D. Moore, P. Dendooven, and J. Ärje. The IGISOL technique—three decades of developments. *Hyperfine Interactions*, 223(1):17–62, 2014.

[3] T. Eronen, V. S. Kolhinen, V. V. Elomaa, D. Gorelov, U. Hager, J. Hakala, A. Jokinen, A. Kankainen, P. Karvonen, S. Kopecky, I. D. Moore, H. Penttilä, S. Rahaman, S. Rinta-Antila, J. Rissanen, A. Saastamoinen, J. Szerypo, C. Weber, and J. Äystö. JYFLTRAP: a Penning trap for precision mass spectroscopy and isobaric purification. *The European Physical Journal A*, 48(4), apr 2012.