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Advances in Gas-Cell Based Resonance Laser Ionisation Methods for Radioactive Ion Beam Production

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The Leuven Isotope Separator Online (LISOL) facility, at the Cyclotron Research Center (CRC), Louvain-la-Neuve, was operated as a gas-cell-based laser ion source to produce rare ion beams by the In-Gas Laser Ionization and Spectroscopy (IGLIS) technique [1]. After almost two decades of operation high-purity radioactive ion beams of more than 15 different elements were obtained exploiting various production mechanisms. Production and thermalization of radioactive species in a cell filled with ultra-pure buffer gas was used in combination with resonant laser radiation for selective ionization of the isotopes of interest either within the gas cell or in the jet formed in the supersonic expansion of the nuclear reaction products while being transferred from a high to a low pressure environment [2]. The photo-ions were then transported by a radio-frequency sextupole ion guide (SPIG) up to the mass separator, where they could be segregated from non-isobaric contamination.

In the last experiments at LISOL, the proof of principle of the in-gas-jet method in on-line conditions was demonstrated with the successful production and laser spectroscopy studies of pure radioactive ion beams of neutron deficient isotopes of $^{214-215}$Ac [3]. The results revealed a significant improvement of the selectivity and the attainable spectral resolution with respect to the gas-cell method without loss in efficiency.

In this talk I will summarize the recent results obtained with the IGLIS technique and will report on the new developments and prospects for future applications of the technique at the new generation radioactive beam facilities [4].

References

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