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FEBIAD ion source operation modes to tune its selectivity: physics processes, numerical simulations and experimental data.

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The FEBIAD ("Forced Electron Beam Induced Arc Discharge") ion sources are used for the production of radioactive 1+ ion beams for a wide range of chemical elements. Their small volume and high operating temperature provide good confinement times and ionization efficiencies. Nevertheless, the source lacks in selectivity, ionizing elements regardless of their ionization potential. Presently, the in-source selectivity can be tuned by making use of the different adsorption enthalpy by optimizing the operating temperature, or by creating molecular compounds of the element of interest.
Within the HIGHINT Marie Curie project, theoretical, numerical and experimental investigations are ongoing for the ion source upgrading towards higher operating pressures and, consequently, higher extracted currents. These investigations let us also tune the selectivity of the source, by operating the source in different modes, which will favor the ionization of a specific class of elements.
When creating a good plasma confinement, the ionization of a gas with a lower ionization potential than the buffer gas should be favored, to the detriment of its residence time.
By using a weak plasma confinement, the ionization selectivity should be increased for elements having different volatilities.
The theoretical model of this approach and the ongoing simulations are presented, as well as some concrete on-line results such as the Chlorine suppression for Argon ionization.

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