ION SOURCE DEVELOPMENT AT TRIUMF'S ISAC FACILITY

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Nuclear astrophysics research at TRIUMF's Isotope Separation and Acceleration (ISAC) facility requires intense Radioactive Ion Beam produced using the Isotope Separation Online (ISOL) method. Radioactive species are produced by a proton beam, of up to 100 μA, impinging on a thick target. Ionization allows for subsequent extraction, mass separation and delivery to low energy experiments or post-acceleration. Here we present two offline ion source studies conducted at the ISAC Ion Source Test Stand: a negative surface ion source for applications in radiopharmacy, and a Forced Electron Beam Induced Arc Discharge (FEBIAD) ion source which is used for online beam delivery at ISAC. Development of a negative surface ion source was motivated by the need to separate ^{186}Re, produced from ^{185}Re(n,γ) reaction, for use in radioimmunotherapy of cancer. In the offline study, ^{185}Re was effectively separated form ^{187}Re with high yield but low ionization efficiency. Possible reasons for this low efficiency are discussed. The FEBIAD Ion source is used at ISAC for the efficient ionization of a broad range of elements. Here we present an offline efficiency optimization for ^{20}Ne. Results show a peak in ionization efficiency for cathode voltage between 130 V to 170 V with low range of magnet coil currents. With increased magnet coil currents ($>$ 60 A), high ionization efficiency was found with cathode voltage between 200 V to 300 V. Results found are in agreement with known electron bombardment ionization cross sections for neon.

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