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A Penning Ion Source for Stable Isotope Beam Production at TRIUMF-OLIS

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The Off-Line Ion Sources (OLIS) facility at TRIUMF is considering replacement of its existing microwave ion source to increase the breadth of available beams for experiments at the Isotope Separator and ACcelerator (ISAC) complex. A Penning ion source is one potential new candidate source, with requirements for beams having A/q < 7 for masses under 30 AMU. Additionally, the Penning source lifetime, beam currents, and beam quality must achieve equal or better performance than the existing microwave source. A new Penning source is being collaboratively developed between SIRC and TRIUMF, utilizing a stand-alone Penning ion source test stand with an adjustable magnetic field up to 1 Tesla. The candidate ions chosen to assess the efficacy and utility of the Penning source are: ⁶Li 1+, ¹²C 2+, ¹⁸O 3+, ²⁴Mg 4+, and ³⁰Si 5+. Here we describe the initial set-up of the Penning test stand and commissioning status. In addition, a study utilizing IBSimu is reported where the magnetic field is varied to maximize separation between the desired isotope and charge state, and others also extracted from the source. For example, for the case of a high purity Oxygen feed-gas, good separation between ¹⁸O 3+ and (¹⁸O 2+, 4+) , and (¹⁶O 2+, 3+, 4+) is necessary.

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