Choosing the right stripper gas for AMS and other applications with tandem accelerators at low and medium terminal voltage

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Recent experimentation with stripper gases used for Accelerator Mass Spectrometry (AMS) has seen a divergence in the practices adopted at laboratories performing AMS of high mass species (such as actinides) at low and medium terminal voltages. At low voltages (<1 MV), the Ion Beam Group at ETH Zurich has demonstrated the advantages of using helium as the stripper gas, for both radiocarbon AMS [1] and for actinides AMS [2]. Meanwhile, at ANSTO we have investigated several gases at 4 MV [3, 4] and find that a multi–atom molecular gas such as sulphur hexafluoride provides the best yield for actinides AMS. In both cases, data published 40 years ago provided clues as to the optimum gas in each situation.

In this paper we will present recent results obtained at ANSTO, where we have used the ANTARES accelerator s ystem to measure charge state distributions for sulphur hexafluoride at 4 MV terminal voltage for injected negative ions ranging from carbon to uranium oxide. The charge state distributions are found to have mean charge states up to 1 charge unit higher than, and to be broader than, corresponding distributions for argon gas, except in the case of carbon beams. As a result, SF_6 is shown to provide significantly higher yields for charge states of heavy ions above the mean charge state. We now perform actinide AMS measurements with 9% yield to the 5^+ charge state, compared to 4-5% achieved previously with argon gas. Potential for yield gains for other ion species of interest for AMS at around 4 to 6 MV will also be discussed.

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[1] T. Schulze-König *et al.*, Nucl. Instr. & Meth. B **269**, 34 (2011).
[2] C. Vockenhuber *et al.*, Nucl. Instr. & Meth. B **294**, 382 (2013).
[3] M.A.C. Hotchkis *et al.*, Nucl. Instr. & Meth. B **294**, 387 (2013).
[4] M.A.C. Hotchkis *et al.*, to be published.