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New plasma techniques for mass separation[1] RENAUD GUEROULT, NATHANIEL J. FISCH, Princeton Plasma Physics Laboratory — Plasma filters offer theoretically an advantage over other types of mass separation in that velocities can be large, elements are dissociated and the costs of ionization are small compared to the cost of chemical separation. Although most of the past studies have been devoted to isotope separation, rotating plasma configurations might also be promising techniques to discriminate elements with large mass difference too. About a decade ago, plasma mass filtering techniques were introduced in order to process nuclear waste. In the Ohkawa filter, as well as in other separation devices based on centrifugal forces, the unconfined heavy stream is collected at the radial outer surfaces, which makes more difficult the collection of the heavy elements. The new mass filter proposed here utilizes centrifugal and magnetic confinement of ions in a way similar to the asymmetric centrifugal trap. This magnetic centrifugal mass filter is shown to be more proliferation resistant than other separation technology and the separation is largely axial, rather than radial, which makes easier the collection of separated elements and reduces the overall contamination of the device.

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