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Rotating, Sodium Plasmas in the Archimedes Demonstration Unit B.P. CLUGGISH, S.F. AGNEW, F. ANDEREGG, R.L. FREEMAN, J. GILLELAND, T.J. HILSABECK, R.C. ISLER, W.D. LEE, A.A. LITVAK, R.L. MILLER, T. OHKAWA, S. PUTVINSKI, K.R. UMSTADTER, D.L. WINSLOW, J. ZHANG, Archimedes Technology Group — Rotating, sodium plasma columns have been created for separation experiments with nuclear waste surrogates in the Archimedes Demonstration Unit (ADU). The ADU is a 0.37 m radius, 3.9 m long, Plasma Mass Filter that uses a radial electric field and an axial magnetic field to separate ions by mass at high throughput. This technology could reduce the volume of high level nuclear tank waste at the Hanford site in Richland, Washington. Sodium is used as a working gas because it is the primary metallic element in the tank waste. An 1100K boiler feeds up to 1 g/s of sodium vapor into the Filter, where 300-500 kW of rf power ionizes it into a plasma of density of $3-4\times10^{18}~{\rm m}^{-3}$ and $T_e \approx 1 - 3$ eV. Measurements indicate that sodium plasmas ExB rotate faster than argon plasmas, presumably because sodium atoms stick to the walls and do not recycle back into the plasma. Profiles of density, velocity, and temperature will be presented and compared to similar measurements in argon plasmas.

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