Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Fusion Ash Separation in the Princeton Field-Reversed Configuration Reactor[1] JOSEPH ABBATE, MEAGAN YEH, NICK MCGREIVY, SAMUEL COHEN, Princeton Plasma Physics Lab — The Princeton Field-Reversed Configuration (PFRC) concept relies on low-neutron production by D-3He fusion to enable small, safe nuclear-fusion reactors to be built, an approach requiring rapid and efficient extraction of fusion ash and energy produced by D-3He fusion reactions. The ash exhaust stream would contain energetic (0.1-1 MeV) protons, T, 3He, and 4He ions and nearly 1e5 cooler (ca. 100 eV) D ions. The T extracted from the reactor would be a valuable fusion product in that it decays into 3He, which could be used as fuel. If the T were not extracted it would be troublesome because of neutron production by the D-T reaction. This paper discusses methods to separate the various species in a PFRC reactors exhaust stream. First, we discuss the use of curved magnetic fields to separate the energetic from the cool components. Then we discuss exploiting material properties, specifically reflection, sputtering threshold, and permeability, to allow separation of the hydrogen from the helium isotopes.

[1]DOE Contract Number DE-AC02-09CH11466

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Date submitted: 15 Jul 2016 Electronic form version 1.4