Contribution ID: **434** Type: **Oral**

Hydrogen Isotope Separation by Cryogenic Chromatography in Processing Tokamak Exhaust Gas

Tuesday 6 June 2017 17:40 (20 minutes)

In addition to rapid recovery and processing plasma ash discharge gases, fast separation of hydrogen isotopes and rapid D-T fuel balance is also an important technical content of TEP system. In this paper a cryogenic chromatography method for reprocessing Tokamak exhaust gas is described. The experimental apparatus consists of a column with carbon molecular sieve used as exhaust storing and purification unit, four columns with 5A molecular sieve operated at the temperature liquid nitrogen to adsorb protium, deuterium and tritium. In order to raise the efficiency and to shorten the total time of isotope separation and the total length of columns between two columns, a disproportionate equilibrator for isotope exchange of HD and HT was inserted. After passing through the cascade columns, the protium, deuterium and tritium are separated cleanly. The overall recoveries of deuterium and tritium for cleanup isotope separation procedure are greater than 97%, the losses are less than 5%, and the protium removing efficiency is larger than 98%. Further refining the process parameters, be able to do better as a result, and is expected to meet the requirements of self-sustaining tritium fuel cycle.

Eligible for student paper award?

No

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Session Classification: T.OP2: Fueling, Exhaust, and Vacuum Systems

Track Classification: Fueling, exhaust, and vacuum systems