

HDT-He Gas Analysis Methods for Fusion Applications

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ABSTRACT

The analysis of HDT-He gas species and impurities is necessary to manage the DT fuel in fusion applications and to measure tritium content of process gas for inventory purposes. Instrumentation and methods developed at DOE sites in the US that handle tritium are pertinent to all fusion sites. This talk will describe the analysis problem, remote inline gas sampling methods, mass spectrometers (MS) that have been used, alternate analysis methods for total tritium (beta scintillation detection BSD) and helium measurements by sample gettering and remeasurement of inert gases and associated data treatment methods to combine analytical information.. Sampling by SS capillary lines provides automation and total containment and recovery of sampled tritium-containing gases. Magnetic sector MS, used for high resolution analysis, and quadrupole MS, used for low and intermediate resolution, will be addressed as tools for high accuracy measurements and for distributed, in-process analytical stations, respectively. Data from both MS types and the beta scintillation detector show $\leq 1\%$ accurate total tritium measurements will be presented which is suitable for process control and in-process inventory measurements.

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