



Standard Test Method for Application and Analysis of Helium Accumulation Fluence Monitors for Reactor Vessel Surveillance, E706 (IIIC)¹

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1. Scope

1.1 This test method describes the concept and use of helium accumulation for neutron fluence dosimetry for reactor vessel surveillance. Although this test method is directed toward applications in vessel surveillance, the concepts and techniques are equally applicable to the general field of neutron dosimetry. The various applications of this test method for reactor vessel surveillance are as follows:

1.1.1 Helium accumulation fluence monitor (HAFM) capsules,

1.1.2 Unencapsulated, or cadmium or gadolinium covered, radiometric monitors (RM) and HAFM wires for helium analysis,

1.1.3 Charpy test block samples for helium accumulation, and

1.1.4 Reactor vessel (RV) wall samples for helium accumulation.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

C859 Terminology Relating to Nuclear Materials

E170 Terminology Relating to Radiation Measurements and Dosimetry

E244 Test Method for Atom Percent Fission in Uranium and

Plutonium Fuel (Mass Spectrometric Method) (Withdrawn 2001)³

E261 Practice for Determining Neutron Fluence, Fluence Rate, and Spectra by Radioactivation Techniques

E482 Guide for Application of Neutron Transport Methods for Reactor Vessel Surveillance, E706 (IID)

E706 Master Matrix for Light-Water Reactor Pressure Vessel Surveillance Standards, E 706(0) (Withdrawn 2011)³

E844 Guide for Sensor Set Design and Irradiation for Reactor Surveillance, E 706 (IIC)

E853 Practice for Analysis and Interpretation of Light-Water Reactor Surveillance Results

E854 Test Method for Application and Analysis of Solid State Track Recorder (SSTR) Monitors for Reactor Surveillance, E706(IIIB)

E900 Guide for Predicting Radiation-Induced Transition Temperature Shift in Reactor Vessel Materials, E706 (IIF)

E944 Guide for Application of Neutron Spectrum Adjustment Methods in Reactor Surveillance, E 706 (IIA)

E1005 Test Method for Application and Analysis of Radiometric Monitors for Reactor Vessel Surveillance, E 706 (IIIA)

E1018 Guide for Application of ASTM Evaluated Cross Section Data File, Matrix E706 (IIB)

3. Terminology

3.1 *Definitions*—For definition of terms used in this test method, refer to Terminology **C859** and **E170**. For terms not defined therein, reference may be made to other published glossaries.⁴

4. Summary of the HAFM Test Method

4.1 Helium accumulation fluence monitors (HAFMs) are passive neutron dosimeters that have a measured reaction product that is helium. The monitors are placed in the reactor locations of interest, and the helium generated through (n, α) reactions accumulates and is retained in the HAFM (or HAFM capsule) until the time of removal, perhaps many years later.

¹ This test method is under the jurisdiction of ASTM Committee **E10** on Nuclear Technology and Applications and is the direct responsibility of Subcommittee **E10.05** on Nuclear Radiation Metrology.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website. The roman numeral-alphabetical designation at the end of some of the titles indicates that a brief description of this standard may be found in Matrix **E706**.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ See *Dictionary of Scientific Terms*, 3rd Edition, Sybil P. Parker, Ed., McGraw Hill, Inc.