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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 11809-2021

Replacing GB/T 11809-2008

Test method of weld of fuel rod for PWR - Metallographic examination and radiographic testing

压水堆燃料棒焊缝检验方法 金相检验和X射线照相检验

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Foreword

This document is in accordance with GB/T 1.1-2020 "Guidelines for Standardization Part

1.Structure and Drafting Rules of Standardization Documents". To be drafted. This document replaces GB/T 11809-2008 "Methods of Metallographic Inspection and X-ray Radiographic Inspection of Welds of PWR Fuel Rods", and Compared with GB/T 11809-2008, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

a) Amend the term "girth weld penetration" to "cladding girth weld penetration" (see 3.1,.2008 edition 3.1), "girth weld penetration depth" "depthofthemeltedzoneofringwelding" is modified to "depthofthemelted zone of ring welding zone" (see 3.2,.2008 version 3.3), "leastthicknessofsoundpartofweldzone" is modified to "minimum thicknessofsoundpartofweldzone" (see 3.5,.2008 version 3.5);

b) Add the terms and definitions of "compact zone length" and "V-shaped groove" (see 3.7, 3.8);

c) The metallographic inspection content for pressure resistance welding welds has been added to the metallographic inspection method (see Chapter 1, 4.5.2.3, 4.5.3.1, 4.6.2);

d) The sandpaper specifications are revised to P120~P2400 (see 4.2.6,

4.2.5 of the.2008 edition);

e) Add the requirements for metallographic samples (see 4.4);

f) The metallographic sampling content is adjusted to Appendix B, which combines the longitudinal sample sampling of the upper end girth weld and the sealing weld joint and the lower end girth weld The figure (see 4.4.1,

4.4.2 of B.1,.2008 edition), adds the sampling method of pressure resistance welding metallographic weld samples, and follows the appendix The order has been adjusted (see

Appendix B,

4.4 of the.2008 edition);

g) GB 16357 is replaced by GBZ 117 (see 5.2,

5.2 of the.2008 edition);

h) Modify the qualifications of X-ray imaging inspectors (see 5.3,

1 Scope

GB/T 11809-2021 is the Chinese national standard on test method of weld of fuel rod for pwr - metallographic examination and radiographic testing, in the field of energy and heat transfer engineering. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 11 October 2021 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 May 2022. Classification: ICS 27.120, CCS F48. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document describes the metallographic inspection and X-ray inspection methods for welds of PWR fuel rods (hereinafter referred to as fuel rods). The metallographic inspection method in this document is applicable to the fusion welding of zirconium alloy fuel rods welded by electron beam and tungsten inert gas protection. Inspection of penetration, defects and microstructure of samples of seams (including girth welds and sealed welds). Also suitable for zirconium bonding by pressure resistance welding Inspection of the dense area of welds welded by gold fuel rods. The thin film etching method is only applicable to Zr-Sn alloy fuel that uses electron beam welding Bar weld inspection. The weld penetration depth and defects of the zirconium alloy guide tube in the fuel assembly and the metallographic inspection of the weld obtained by other welding methods can also be referred to implement. The X-ray inspection method in this document is applicable to the inspection of fuel rod girth welds and sealing welds, and the control of PWR fuel assemblies Circumferential welds of rods, combustible poison rods, neutron source rods and guide tube components, and other stack-type similar fuel rods can also be implemented by reference.

2 Normative references

The content of the following documents constitutes an indispensable clause of this document through normative references in the text. Among them, dated quotations Only the version corresponding to the date is applicable to this document; for undated reference

documents, the latest version (including all amendments) is applicable to This document.

GB/T 3375 Welding Terminology

GB/T 6394 Method for determination of average grain size of metals

GB/T 12604.2 Non-destructive testing terminology Radiographic testing

GB 18871 Basic Standards for Ionizing Radiation Protection and Radiation Source Safety

GB/T 19348.1-2014 Non-destructive testing industrial radiographic film Part

3 Terms and definitions

The following terms and definitions defined in GB/T 3375 and GB/T 12604.2 apply to this document.

3.1 Penetrationoftheringwelding Sh The welding thickness of the cladding tube and the end plug (see Figure 1).