

Research on Closed-end Burst Testing of Irradiated Fuel Cladding Tube

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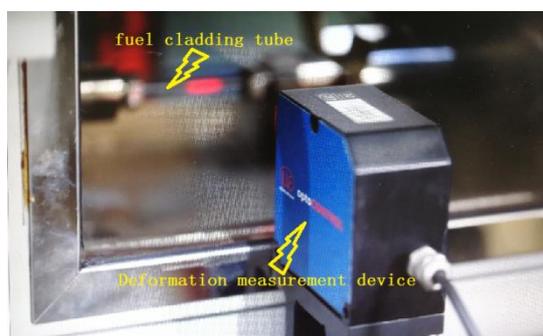
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Closed-end burst testing of irradiation fuel cladding tube is one of the important detection for irradiation fuel assembly. The fuel cladding tube is endured internal pressure formed fuel core swelling and fission gas during reactor operation. Pressure resistance directly affects the integrity of cladding tube that is essential for safe operation of reactor. Closed-end burst testing can simulate stress state during condition of high temperature and high pressure. Therefore, closed-end burst testing is one of the important inspection items for fuel assembly. Due to the radioactivity of the cladding tube after irradiation, the sealing performance and deformation measurement of cladding tube are one of the key technologies for the closed-end burst testing. Therefore, this paper designed an automatic locking sealing device and deformation measurement continuously device based on the principle of closed-end burst testing, See Figures P19 and P20.



FigureP19: Automatic locking sealing device



FigureP20: Deformation measurement device

Closed-end burst testing was carried using cladding tube of Zr-4 alloy, and obtained the burst strength and circumferential elongation of Zr-4 alloy before and after irradiation, Burst crevasse analysis of fuel tube before and after irradiation was carried out. The test results showed that the automatic sealing and locking device of the cladding tube can achieve the blasting pressure of over 200MPa, and the continuous deformation measurement device can realize non-contact and real-time measurement of the diameter variation in the process of closed-end burst testing of cladding tube, and the measurement accuracy can reach 5 μ m, which the circumferential deformation of the cladding tube in the process of closed-end testing was obtained with the internal pressure change. The two devices designed were well applied to the burst testing of the irradiated cladding tube, and avoided the irradiation dose of the experimenter.

Key Words: Closed-end burst testing, Fuel cladding tube, Automatic locking sealing device, Deformation measurement device