

Blister Defect Analysis of U_3Si_2/Al Nuclear Fuel Cladding by Ultrasonic Test

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Fuel integrity is one of safety considerations during nuclear reactor operation. Any defect resulted after reactor operation should be avoided. Thus, in nuclear fuel development, post-irradiation examination is necessary to be performed to ensure fuel integrity. Non-destructive test using ultrasonic method is one of alternative methods to perform post-irradiation examination. The objective of this analysis is to detect blister defect in cladding of plate type nuclear fuel. In post irradiation examination (PIE) using ultrasonic method, the operation parameters are necessary to determine. In this experiment, this analysis method was conducted on U_3Si_2/Al fuel element cladding consisting blister defect. Ultrasonic tests were done using two techniques, i. e. pulse-echo and through transmission techniques. The results were presented in A-scan display. The results show that the longitudinal wave speed in water used in the testing is 1545 m/s. The optimal distance between the probe and the specimen when using pulse-echo technique is 20 mm. The optimal distance between the two probes when using through transmission technique is 40 mm. Tests at blister area using pulse-echo technique caused output signal to decrease by 19 %FSH, while through transmission technique caused output signal to decrease by 80 %FSH. According to the results it can be concluded that ultrasonic test is effective to detect a blister defect in plate type nuclear fuel, and through transmission technique exhibited a clearer difference between normal area and blister area in fuel cladding when compared to pulse-echo technique.

Keywords. *ultrasonic test, U_3Si_2/Al fuel cladding, blister, pulse-echo, through transmission.*

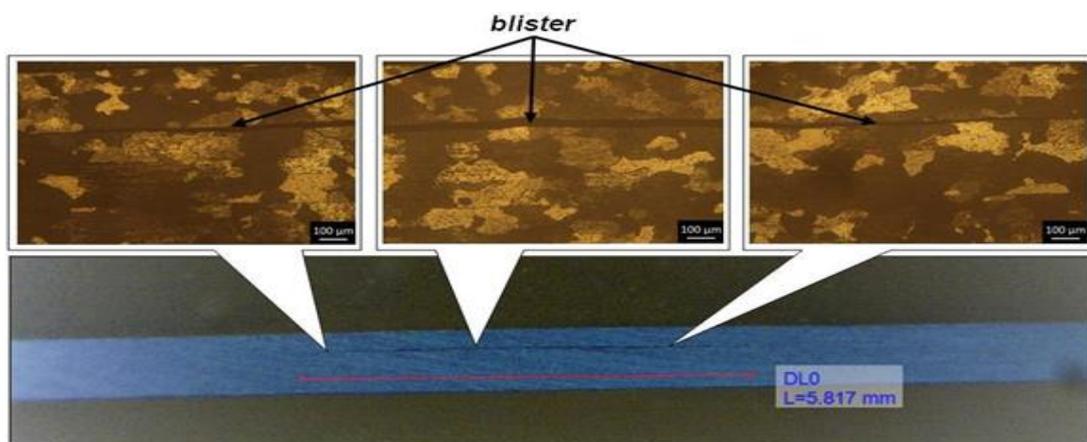


Figure 24: Microstructure blister defect from U_3Si_2/Al Nuclear Fuel Cladding