

High Temperature Blistering Test Device with Shielded Glove Box for U_3Si_2/Al Fuel Element Under Loss of Coolant Accident

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Blistering is one of the critical failure factors of U_3Si_2/Al fuel element under neutron irradiation. The flow channels of fuel assembly for coolant are narrowed after blistering of fuel element, which affects the safe operation of reactor. With the loss of coolant, the temperature of fuel element rise rapidly under loss of coolant accident (LOCA) condition. The fission gas diffusion and aggregation in fuel element is accelerated, and the internal pressure of fission gas is increased, which may lead to blistering of fuel element. Therefore, blistering test is very important to study high temperature failure behavior of U_3Si_2/Al fuel element.

At present, the study of the high temperature failure behavior of fuel element under LOCA condition were mainly aimed at rod type fuel element. There are few reports on U_3Si_2/Al and other plate type fuel element. Meanwhile, the facilities used in the study of rod type fuel element are not suitable for plate type fuel. In order to obtain the blistering data and study the growth of blister of U_3Si_2/Al fuel element under LOCA condition, a high temperature blistering test device with shielded glove box is designed, which consists of induction heating system, steam generator, temperature measurement system, quenching cooling system and real-time monitoring system. It can realize the functions of different atmosphere environment, rapid heating, rapid quenching, accurate temperature measurement, on-line monitoring and deformation surveying. Now, The device has been built and is being installed and debugged. Preliminary experiments show that the device is functional. and some interesting data are obtained, which can help understand the blistering behavior of U_3Si_2/Al fuel element under LOCA condition.

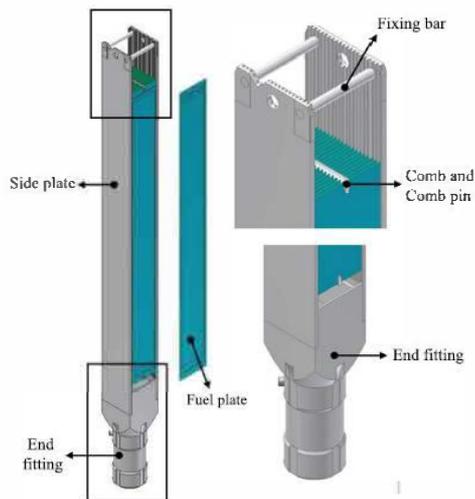


Figure 1. Configuration of plate-type fuel assembly designed by KAERI

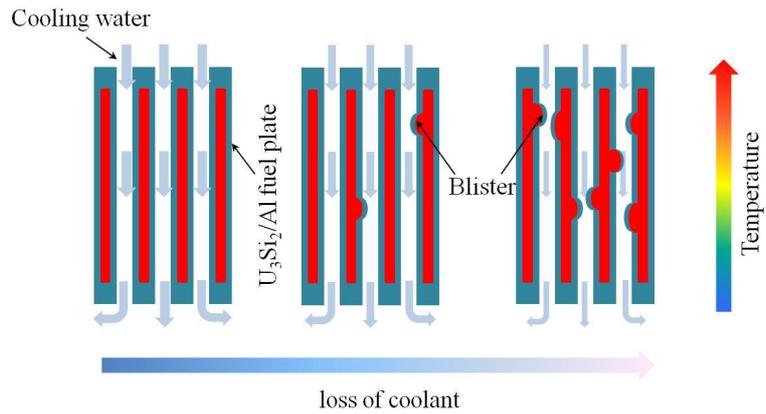


Figure 2. Blistering schematic diagram of U_3Si_2/Al plate fuel element under LOCA

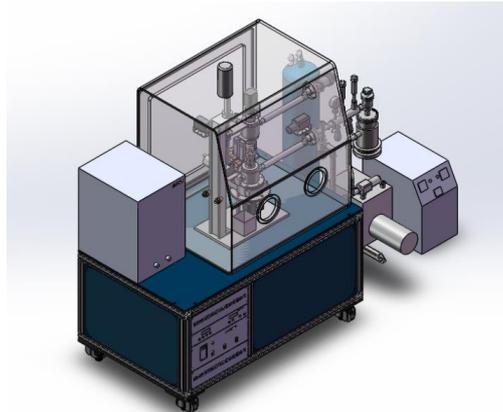


Figure 3. High temperature blistering test device with shielded glove box

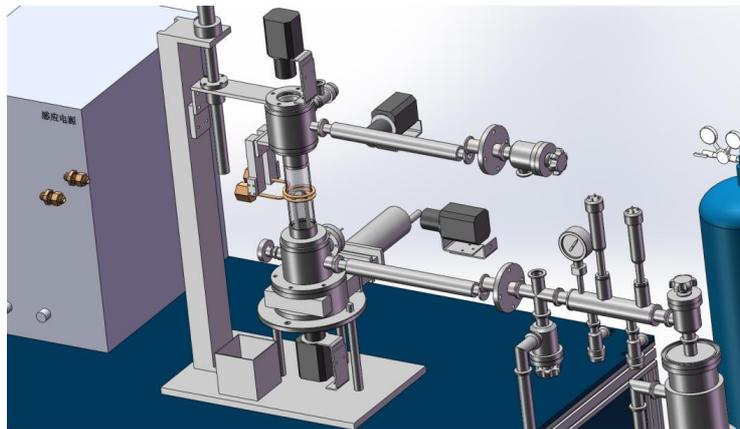


Figure 4. Details of high temperature blistering test device