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Post-irradiation examinations of SINQ Target-11

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SINQ Target-11 was in operation in 2015 and 2016. It was shut-down due to an incident in June 2016, during which the pressure drop in the cooling water loop increased significantly, and meanwhile, the activity of the cooling water also increased tremendously. The evidence indicated a serious failure of the target. As this is the first severe failure since SINQ was in operation in 1997, the target has to be investigated by detailed post-irradiation examinations (PIE).

The target was opened in a hot-cell next to the SINQ target station (ATEC) in June 2017. After removing the AlMg3 safety container, it was observed that lead (Pb) was melted and leaking out from the bottom of the target-block. The empty tubes in the first row of the target were broken. During extracting some target rods for PIE, it was found that the rods in the lower part of the target could not be pulled out. This implies the core of the target was broken and the Pb was melted and froze the rods in this part.

The rods/tubes selected for PIE are those which could be removed from the target and which have a relatively high irradiation dose. Neutron radiography inspection was conducted to reveal the status of Pb in the rods. Afterwards, these rods/tubes were sent to PSI's hot laboratory for detailed PIE, including: (1) Hardness measurement, (2) Metallography (with etching for viewing hydrides), (3) Electron Probe Microanalysis (EPMA), (4) Ring compression and tension testing, (5) Transmission Electron Microscopy (TEM) observations. Up to date, the first three PIE items have been done. In this presentation the available results will be shown in detail and the potential failure mechanisms will be briefly discussed.

Primary author: Dr DAI, Yong (Paul Scherrer Institute)

Presenter: Dr DAI, Yong (Paul Scherrer Institute)

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