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Testing of electrochemical hydrogen meter in a sodium facility in Cadarache

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An electrochemical hydrogen meter (ECHM) developed in IGCAR, India has been tested in a sodium facility in CEA Cadarache, France as part of IGCAR-CEA collaboration of fast reactor safety. ECHM is basically a concentration cell which can be used for online monitoring of hydrogen concentration in ppb levels in liquid sodium in order to detect the eventuality of steam leak in the sodium circuit at its inception, during the operation of fast breeder reactors. A detailed description of ECHM is given in ref.[1]. These sensors were successfully tested in Fast Breeder Test Reactor (FBTR), large sodium facility of IGCAR and in Phenix, France [2]. ECHM provides an alternate technology to the conventional diffusion based hydrogen sensor for detecting steam leaks into sodium. It is a robust and inexpensive sensor and is simple to operate.

ECHM has been installed in the SUPERFENNEC sodium loop facility at Cadarache, France, along with the conventional hydrogen detection system (SPHYNX).

Prior to the tests both ECHM and conventional hydrogen detection system (SPHYNX) were calibrated. ECHM has been calibrated at an operating temperature of 450°C in a bench top sodium loop with respect to cold trap temperature variations. SPHYNX system was calibrated in SUPERFENNEC loop for calibrated H₂ leak. Tests were carried out initially by introducing NaOH in liquid sodium. Subsequently, NaH additions were also carried out. The performance of both ECHM and SPHYNX were monitored as a function of hydrogen concentration and temperature. Hydrogen concentrations in sodium were varied by adding NaH equivalent to 25 ppb to 150 ppb above the background value and temperature was varied from 424 to 453°C. The response, by both the sensors, was nearly identical at the operating temperature at which ECHM was calibrated in IGCAR. The study revealed that the performance of both the sensors were comparable.

Country/Int. Organization

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