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## Development of an electrochemical sensor for hydrogen detection in liquid lithium for IFMIF-DONES

Monday, 17 September 2018 11:00 (2 hours)

The structural materials in fusion reactors as DEMO and future power plants are under strong irradiation and will suffer from radiation damages. The knowledge of the radiation induced degradation is planned to be investigated in IFMIF-DONES, a facility in which fast neutrons are produced by a reaction of a D-beam with a liquid lithium target. The operation of such a system requires the control and measurement of impurity concentrations in the melt, thereunder hydrogen. Electrochemistry offers diagnostic tools to measure directly concentrations in such media by online-monitoring systems. Based on this technology, an electrochemical H-sensor for operation in liquid lithium is under development.

This presentation will line-out the physical background of measuring non-metallic impurity levels in molten metals by measuring electrochemical potentials and their transformation by Nernst correlation into concentrations. Liquid lithium is a very reactive melt, thus material section will be an essential topic for development of a reliably working sensor together with the materials, which can be used as hydrogen-conducting electrolytes in such a sensor. This material behaviour and properties will be discussed. Based on these issues a sensor design for hydrogen in liquid lithium was set up. The successful manufacturing and assembling of the sensor will be shown beyond the synthesis of the electrolytes which are essential for a pre-qualification of the sensor in liquid lithium. These tests are conducted under cleaned Ar atmosphere in a glove-box system as well as the whole sensor assembling. The outlook will deal with measurements in lithium of different hydrogen concentrations.

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