Contribution ID: **13** Type: **Poster**

#04-13 Experimental study of ISHTAR thermostatic irradiation device for the MARIA research reactor

Thursday, June 24, 2021 4:40 PM (5 minutes)

Materials and core components for the next generation power reactors technologies require testing that can be performed in existing research reactors. Such experiments employ devices dedicated to reflect the relevant thermal and neutron parameters simulating conditions present in, for example, but not limited to, HTR reactors. A novel thermostatic irradiation device named ISHTAR (**I**rradiation **S**ystem for **H**igh-**T**empera**t**ure **R**eactors) has been designed and constructed in the MARIA research reactor. Its mission is to enable irradiation of samples in controlled, homogeneous temperature field reaching 1000 ℃ and inert gas atmosphere. The high temperature is achieved by a combination of electric and gamma heating, together with carefully designed thermal insulation. Additionally samples holder made of graphite with high thermal conductivity enables the temperature homogenization in all directions. Device will be placed inside the Beryllium matrix of MARIA core and cooled with forced circulation of water from the reactor pool loop. This paper presents the outcome of experiments conducted with the rig prototype in external hydraulic mock-up of the MARIA reactor irradiation channel. The results have proved that the desired conditions for irradiation of the samples were achieved and their comparison against computational data has shown the adequacy of the design process. Finally, the loss of flow scenario was tested in protected and unprotected conditions (meaning with and without the safety system based on temperature feedback), proving the operational safety of the ISHTAR design. Experimental results will be used in the future to validate the numerical models (two and three dimensional) of the irradiation rig, providing an improved understanding of free convection and radiation phenomena modeling.

Primary authors: LIPKA, Maciej (National Centre for Nuclear Research); TALAROWSKA, Anna (National Centre for Nuclear Research); WOJTANIA, Grzegorz (National Centre for Nuclear Research); MIGDAL, Marek (National Centre for Nuclear Research)

Presenter: LIPKA, Maciej (National Centre for Nuclear Research)

Session Classification: 04 Research Reactors and Particle Accelerators

Track Classification: 04 Research Reactors and Particle Accelerators