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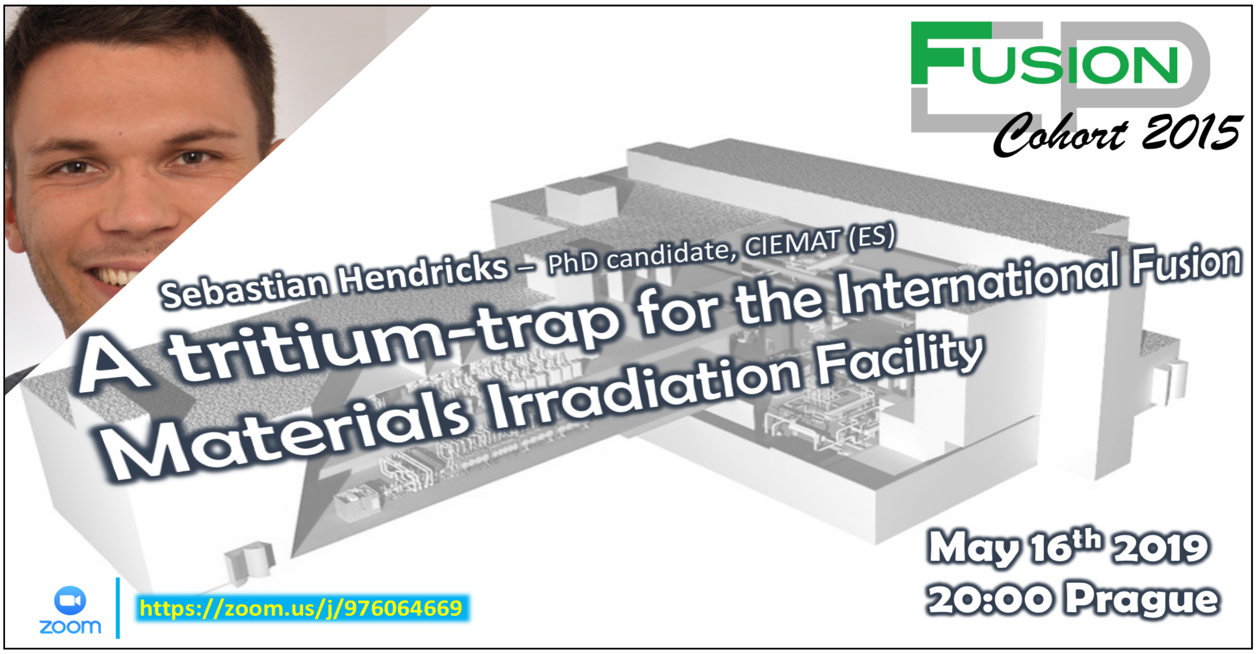

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Title: A tritium-trap for IFMIF

Speaker: Sebastian Hendricks – PhD candidate, CIEMAT (ES)

When: 2019-05-16 20:00:00

Abstract: Ensuring a secure and reliable execution of the future neutron irradiation facility IFMIF/DONES requires its liquid lithium loop to be purified from hydrogen isotopes which are generated during operation. In order to fulfil the demanded limits of hydrogen isotope concentration in the loop an yttrium pebble bed is thought to serve as a hydrogen hot trap. In the past several experiments have been done with the purpose to measure those system specific parameters which determine the final efficiency and removal rate of the hydrogen trap like the solubility and diffusivity of hydrogen in lithium and yttrium as well as the mass transfer coefficient between a fluid and a solid pebble bed. In addition, numerical studies have been executed estimating the final absorption flux into the trap by assuming either a constant or concentration dependent trap efficiency. However, this rather weak assumption does not allow to reproduce or explain experimental data in a quality that would be sufficient for a reliable design of a tritium trap for IFMIF/DONES. For this purpose a detailed numerical simulation model of tritium transport into the yttrium pebble bed is required and has been developed from scratch within the framework of this work using the software EcosimPro. The tritium absorption flux into the pebble bed is simulated by solving Fick's second law for a number of spherical bodies. As a boundary condition for the concentration at the pebble surfaces the equilibrium of partial pressures of tritium in liquid lithium and yttrium is considered. A second boundary condition is given by the equilibrium between the pebble surface diffusion flux given by Fick's first law and the mass transfer flux of tritium in liquid lithium. The tritium mass transfer coefficient for flowing liquid lithium through an yttrium pebble bed could be numerically estimated within the scope of this work and is found to mainly determine the lithium flow rate and the trap efficiency. Using the developed numeri

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