Contribution ID: **80** Type: **invited**

FESTIM and HTM: leading Open-Source hydrogen transport modelling

Thursday, 18 July 2024 14:25 (25 minutes)

Hydrogen transport modelling is crucial for the development of fusion energy, where understanding tritium behaviour in materials is essential for both safety and component design, such as the breeding blanket and plasma-facing materials. Traditionally, this modelling has been dominated by closed-source tools like TMAP7 or in-house codes, leading to fragmented efforts and limited accessibility within the research community. This presentation aims to introduce and advocate for two pioneering open-source solutions: FESTIM and HTM, which address these challenges and exemplify the benefits of **open-source software**.

FESTIM is a Python-based tool built on the FEniCS finite element library simulating hydrogen transport in materials. It stands out with its extensive verification and validation, comprehensive documentation, and a growing user community spanning over 23 institutions worldwide. FESTIM facilitates simulations of tritium transport, offering transparency, flexibility, and ease of use.

HTM complements FESTIM by providing a dynamic and interactive Python library for hydrogen transport properties. Replacing outdated static paper reviews, HTM automates many manual processes, such as unit conversions and data fitting, and integrates seamlessly into research workflows. Its open-source nature allows for continuous updates and community contributions, ensuring accuracy and relevance.

Together, FESTIM and HTM represent a significant step forward in hydrogen transport modelling. They have been applied to a variety of scenarios, from retention studies in ITER to hydrogen embrittlement research. By fostering a collaborative environment, these tools not only enhance the accuracy and efficiency of hydrogen transport simulations but also democratise access to advanced modelling capabilities.

Primary author: DELAPORTE-MATHURIN, Remi (Plasma Science and Fusion Center, MIT)

Co-authors: Mr DARK, James (CEA); Dr FUERST, Thomas (INL)

Presenter: DELAPORTE-MATHURIN, Remi (Plasma Science and Fusion Center, MIT)

Session Classification: PSI and PMI modelling