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Numerical simulation and experimental validation of MHD Turbulent Heat Transfer for Molten Salts at Low Magnetic Field[1] EDOARDO PRATO, CAROLINE SORENSEN, ZACHARY HARTWIG, Massachusetts Institute of Technology — The molten salt FLiBe is a candidate for the liquid breeder blanket in the design of the ARC fusion reactor [Sorbom et al 2015]. FLiBe's electrical conductivity is multiple orders of magnitude lower than those of liquid metals used in fusion designs. It considerably reduces the magnetohydrodynamic (MHD) effects that arise due to the presence of high magnetic field. Turbulence suppression and heat transfer degradation are observed in MHD flows. Considering these constraints is necessary for the ARC design to guarantee the heat extraction capability of the molten salt coolant. MHD simulations for laminar MHD flows have been run by using several CFD commercial tools and have been verified following Smolentsev 2015 guidelines. Turbulence is treated with hydrodynamic RANS models for which coefficients have been modified tanking into account MHD effects. At MIT an experimental campaign has been launched to measure MHD heat transfer reduction using a FLiBe simulant fluid flowing through a 2T magnet. The aim of the investigation is to observe ARC relevant conditions which are still unexplored (ie: low Rm, high Ha,Re,Pr). The proposed MHD RANS models such as Yamamoto 2017 based on DNS simulation can be validated and/or new ones can be built with the experimental data.

[1]Eni LIFT

Edoardo Prato
Massachusetts Institute of Technology

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