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Application of the Thermoelectric Effect on the Liquid Lithium Heat Transfer[1] WENYU XU, VIJAY SURLA, DAVID RUZIC, University of Illinois at Urbana-Champaign — Recently liquid lithium has drawn a lot of interest due to its large potential to suppress hydrogen recycling and lower the impurity level in tokamaks. A series of experiments have been conducted on Solid/Liquid Lithium Divertor Experiment (SLiDE) facility at the University of Illinois which found that the thermoelectric effect is responsible for enabling the liquid lithium to absorb power, such as the 60 MW/m2 e-beam spot on CDX-U, without significant evaporation. Taking advantage of the observed results in SLiDE, a new concept called Lithium / Molybdenum Infused Trenches (LIMIT) is developed. In this design, millimeter thick trenches are used to hold the flowing liquid lithium by capillary force, while the flow of lithium is still driven by thermoelectric force. The lithium trenches are 2 mm thick, 10 mm deep and 90 mm long. A 5 mm gap between the trenches and the stainless steel tray is formed to conduct the back flow. A linear electron beam generating almost 1MW/m2 heat flux is used to heat the surface of the stainless steel trenches with a small impact angle and the magnetic field is at the same direction as the beam. The detailed heat flux analysis using existing diagnostics, with LIMIT structure housed in SLiDE, is presented.

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