Abstract Submitted
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A compact self-flowing lithium system for use in an industrial neutron source.[1] KISHOR KUMAR KALATHIPARAMBIL, MATTHEW SZOTT, University of Illinois at Urbana-Champaign, BRIAN JURCZYK, Starfire Industries, CHISUNG AHN, Sungkyunkwan University, DAVID RUZIC, University of Illinois at Urbana-Champaign — A compact trench module to flow liquid lithium in closed loops for handling high heat and particle flux have been fabricated and tested at UIUC. The module was designed to demonstrate the proof of concept in utilizing liquid metals for two principal objectives: i) as self-healing low Z plasma facing components, which is expected to solve the issues facing the current high Z components and ii) using flowing lithium as an MeV-level neutron source. A continuously flowing lithium loop ensures a fresh lithium interface and also accommodate a higher concentration of D, enabling advanced D-Li reactions without using any radioactive tritium. Such a system is expected to have a base yield of ˜10e7 n/s. For both the applications, the key success factor of the module is attaining the necessary high flow velocity of the lithium especially over the impact area, which will be the disruptive plasma events in fusion reactors and the incident ion beam for the neutron beam source. This was achieved by the efficient shaping of the trenches to exploit the nozzle effect in liquid flow. The compactness of the module, which can also be scaled as desired, was fulfilled by the use of high Tc permanent magnets and air cooled channels attained the necessary temperature gradient for driving the lithium. The design considerations and parameters, experimental arrangements involving lithium filling and attaining flow, data and results obtained will be elaborated.

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