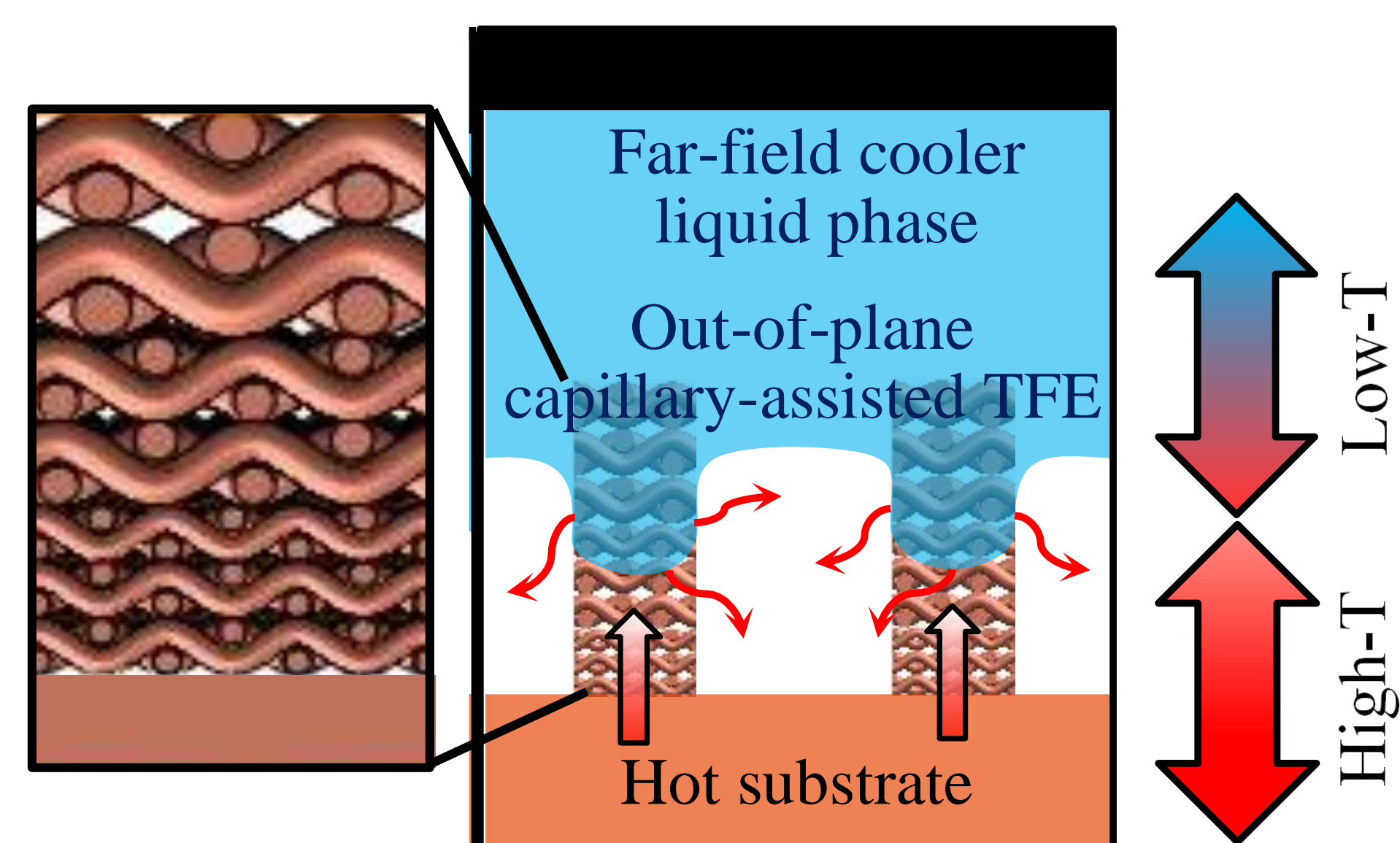


Introduction and Motivation

- Liquid supply to homogenous wick structures of flow boiling surfaces is restricted by the capillary limit.
- Gradient wick (GW) structures partially decouple permeability and capillary pressure, thereby delaying the capillary limit.

Concept and method

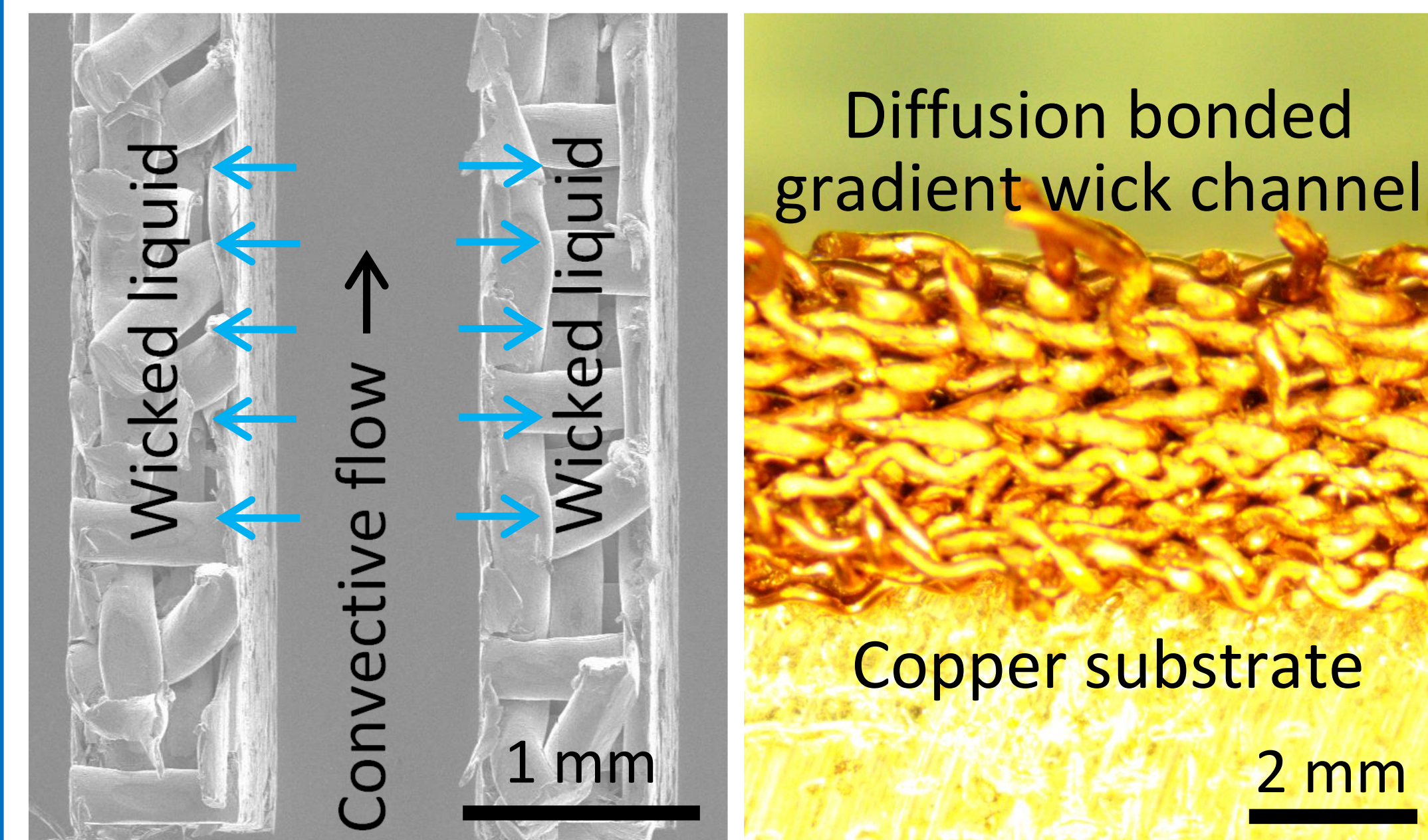
- Here, permeability of the gradient wick channels is augmented by large-pore-size meshes employed near the bulk fluid while capillary pressure is maximized by small-pore-size meshes utilized near the hot boiling surface.



A schematic of proposed gradient wick heat sink and possible liquid-vapor interface

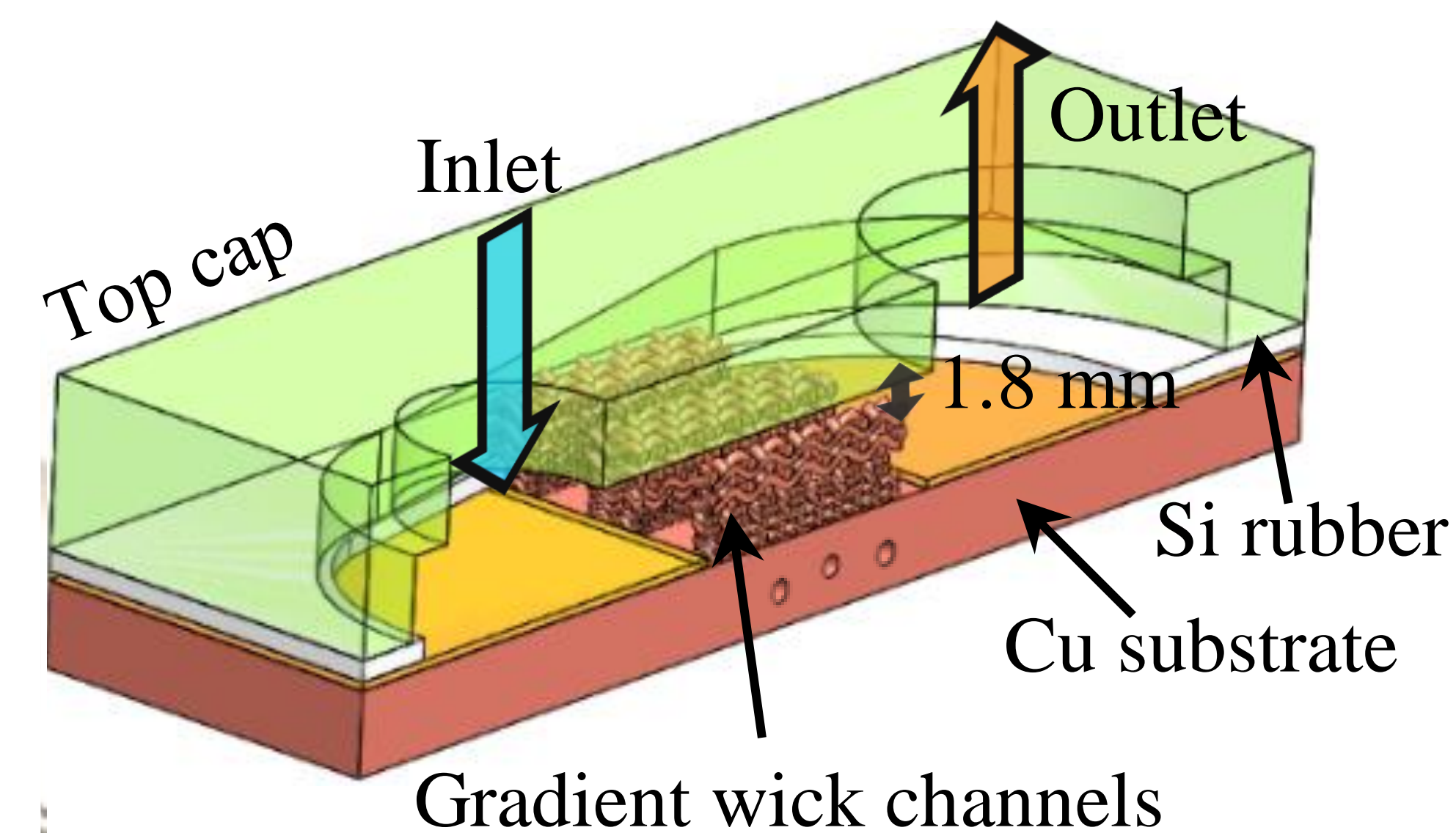
Experiment

Test apparatus

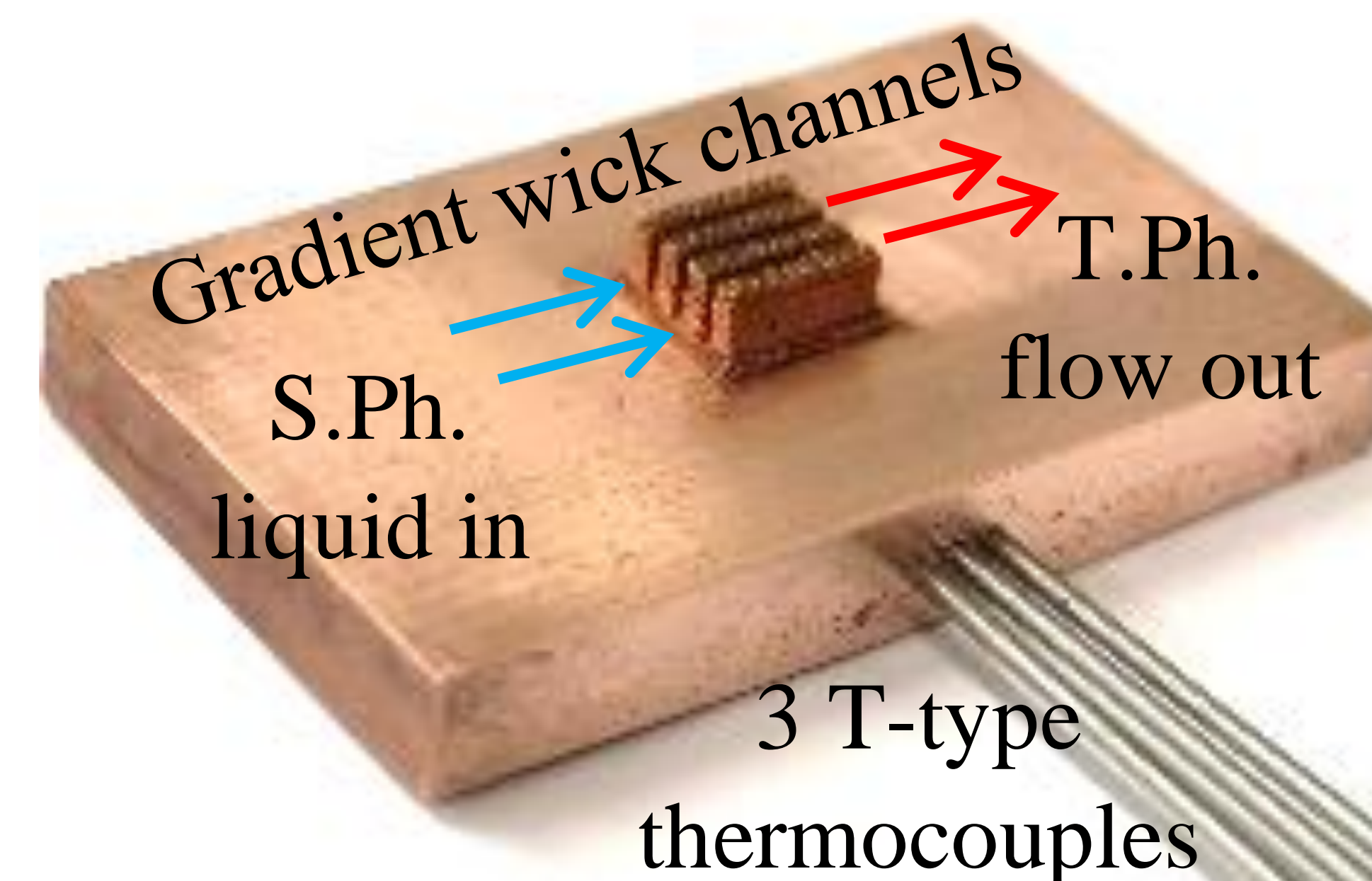


A SEM image of gradient wick channels A cross-sectional view of gradient wick channels

Flow boiling test setup



A schematic of the test section

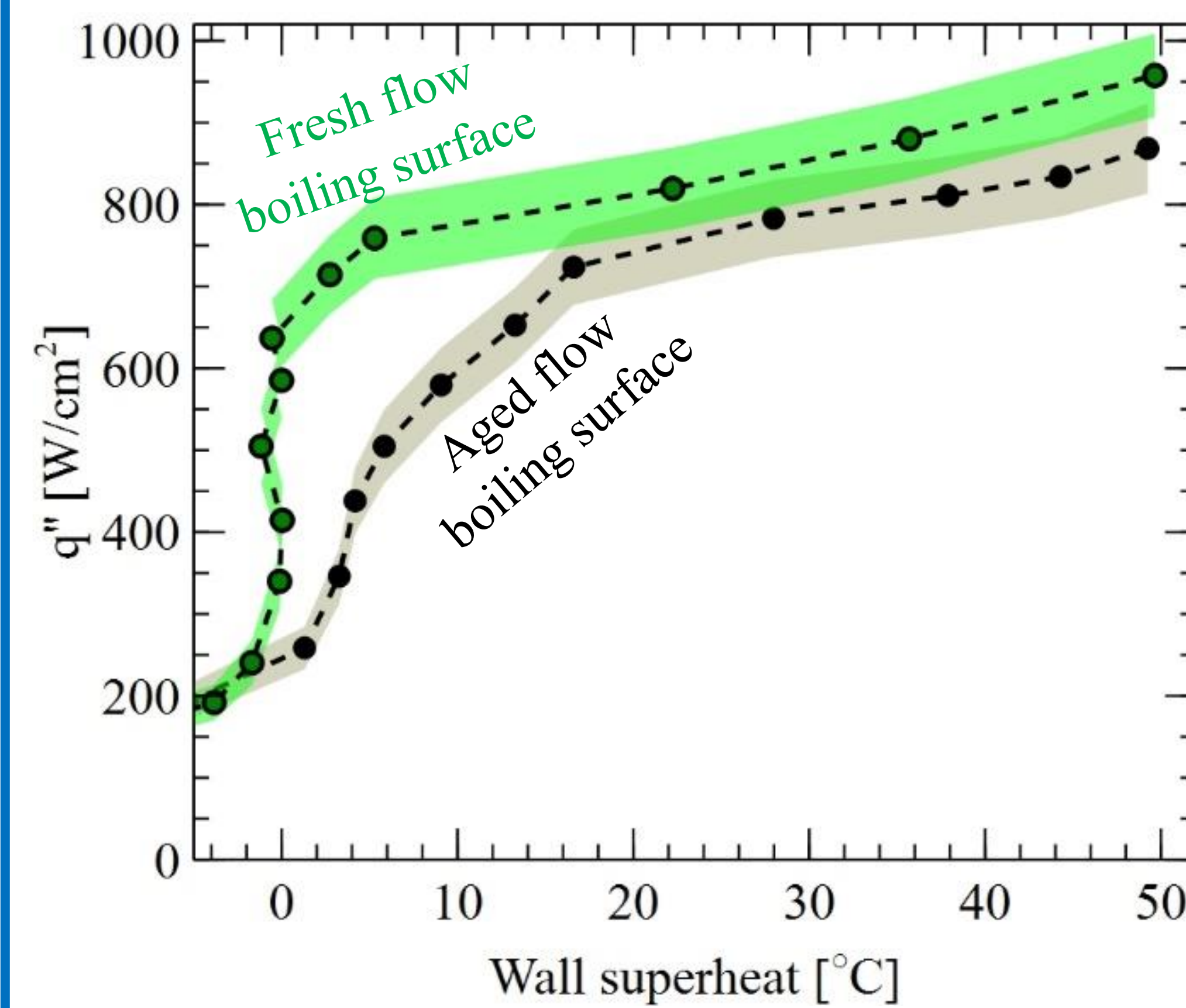


Test article

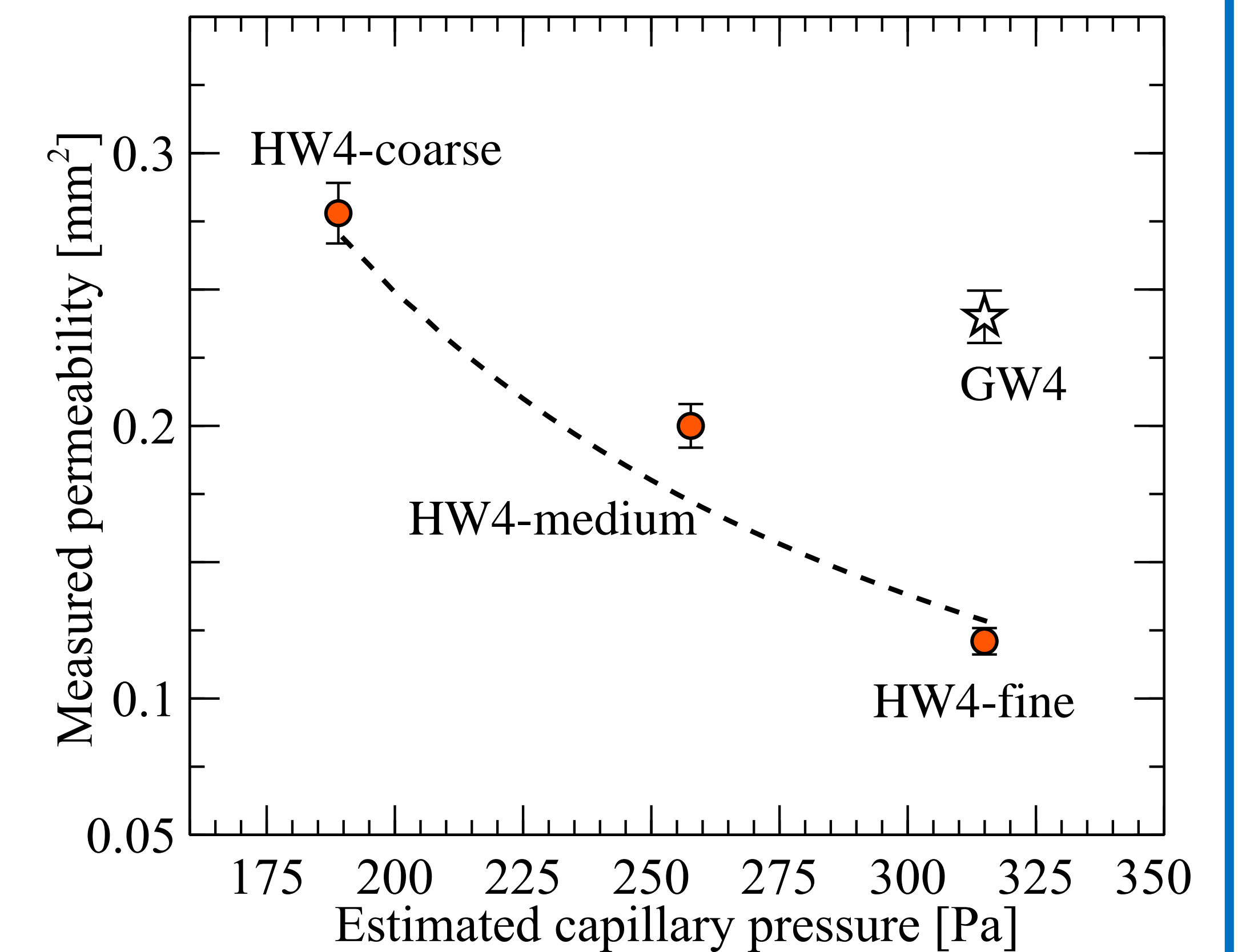
Results and conclusion

Aging effect and permeability

Flow boiling performance of a fresh and aged heat sink.

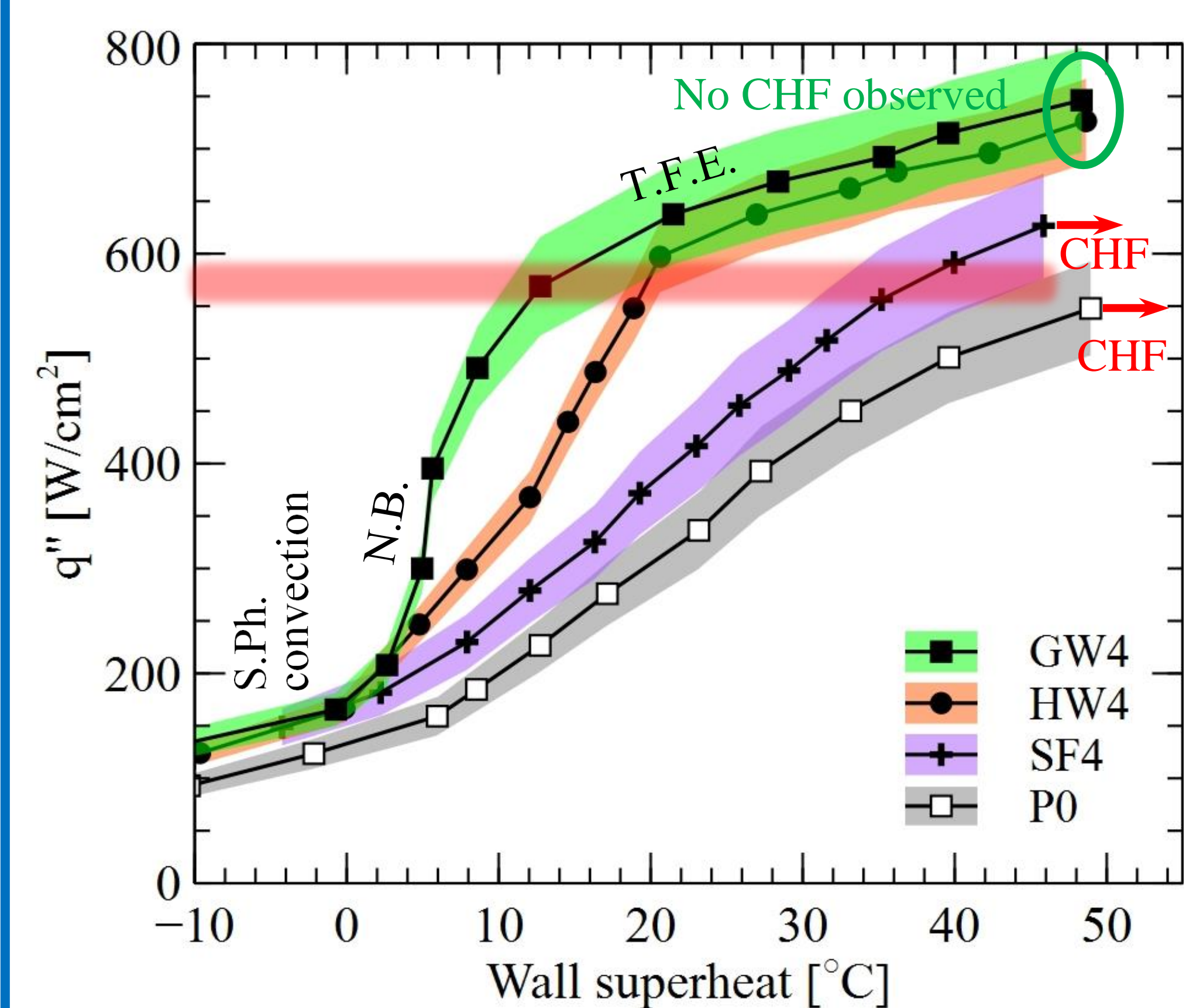


Permeability versus capillary pressure for homogenous and gradient wick structures.

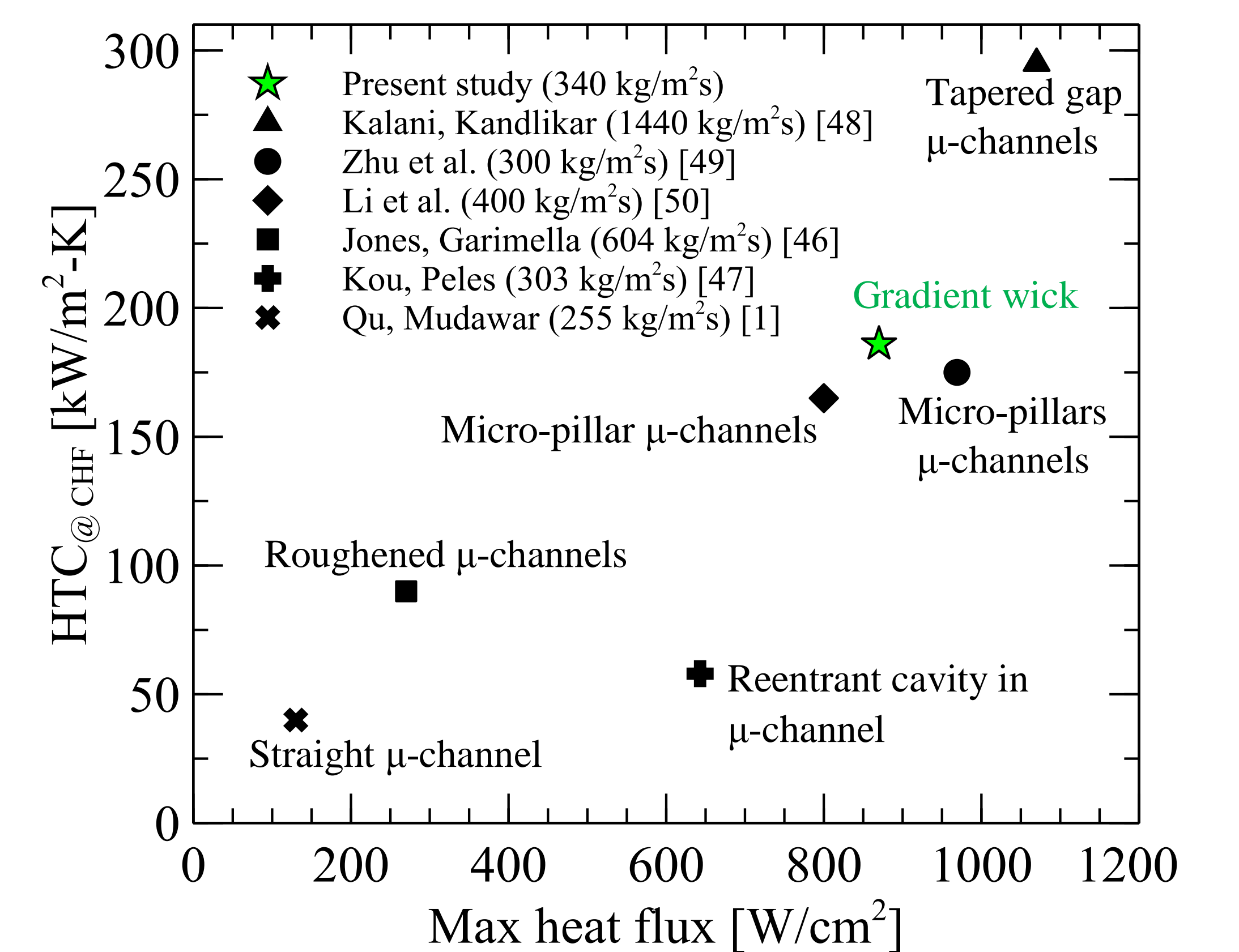


Performance comparison

Flow boiling performances of gradient wick, homogenous wick, and solid channels.



A comparison of the proposed GW heat sink with data from open literature.



- For more information, please see: Masoud Ahmadi, Sajjad Bigham, Gradient Wick Channels for Enhanced Flow Boiling HTC and Delayed CHF, Int J. Heat and Mass transfer, accepted in Nov. 2020.