Liquid-Artery Wick Evaporator for Enhanced Pool- and Flow-boiling Systems

Yahya Nasersharifi

A phase-change phenomenon, i.e, liquid-vapor, can be utilized as an efficient mean of removing heat from a heated surface through an evaporator. The bottleneck in the evaporator is two folds, large thermal resistance and limited maximum heat flux (Critical Heat Flux, CHF). At high heat flux, the significant vapor generates near the evaporation surface, and in turn it results in hindering liquid supply to the evaporation surface (liquid choking) and heat transfer (large thermal resistance). A novel evaporator need to yield both the low thermal resistance and high CHF. By re-designing the surface to provide liquid continuously and by separation of vapor and liquid paths, it is possible to overcome the limitations such as chocking limit. In this regard, application of modulated porous layer coatings, canopy wicks, and nano coatings have been successful methods to decrease the thermal resistance due to the lack of liquid supply. My approach is to test the effects of modulated and wick structures as liquid artery to increase coolant feed to the evaporation surface. Different types of structures in vertical and horizontal configurations, by different sizes and shapes, will be examined and experimental results will be compared to the thermo-hydraulic theory and/or capillary-viscous models. The experiment is performed using *n*-pentane as the working fluid.