

Heat Transfer During Evaporation of Binary Liquids from Wick Microstructures

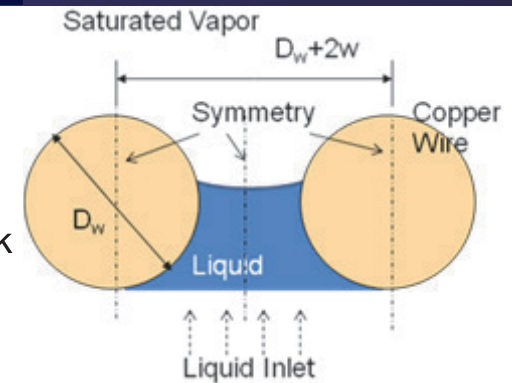
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OBJECTIVE

Development of a numerical model for computing the evaporation of binary liquids from wick microstructures under saturated vapor conditions.

EVAPORATION MODEL

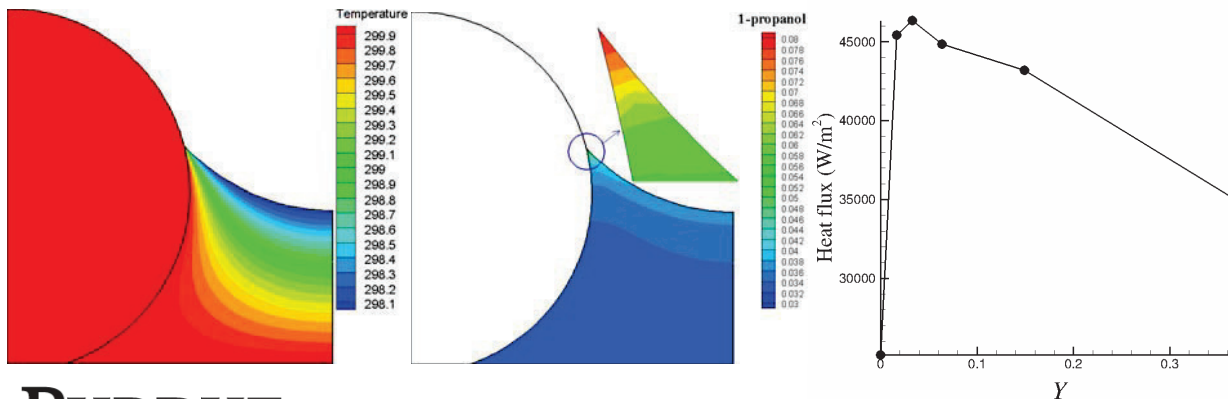
- User -Defined functions have been developed in Fluent to implement the evaporation model.
- The shape of the liquid-vapor interface in the wick structure is obtained using Surface Evolver.
- The binary fluid mixtures contains water-liquid and 1-propanol-liquid as species.
- The wick is made of copper.



Geometry of the problem

RESULTS

- The addition of 1-propanol is found to increase the overall evaporation rate and hence the overall heat transfer.
- It is found that the water evaporation rate exhibits a maximum at 3.26% mass fraction (Y); correspondingly, the heat flux also exhibits a maximum at this value.



SELECTED PUBLICATIONS

- Wang, H., Murthy, J. Y., and Garimella, S. V., 2007, "Transport from a Volatile Meniscus inside an Open Microtube", *Int. J. Heat and Mass Transfer*, **51**, pp. 3007-3017.
- Dhavaleswarapu, H. K., Chamarthy, P., Garimella, S. V., and Murthy, J. Y., 2007, "Experimental Investigation of Steady Buoyant-Thermocapillary Convection near an Meniscus", *Physics of Fluids*, **19**, pp. 082103.
- Ranjan, R., Murthy, J. Y., and Garimella, S. V., 2009, "Analysis of the Wicking and Thin-film Evaporation Characteristics of Wick Microstructures", *ASME J. Heat Transfer*, **331**, pp. 1-10.
- Dalal, A., Ranjan, R., Murthy, J. Y., and Garimella, S. V., "Heat Transfer during Evaporation of Binary Liquids in Wick Microstructure", 2010 **SOULAS** Heat and Mass Transfer Conference, **TECHNOLOGIES RESEARCH CENTER** Bombay, Mumbai, India.