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# NUMERICAL ANALYSIS OF TWO-PHASE FLOW AND HEAT TRANSFER IN A HEAT PIPE MODEL IN VIEW OF THE SRWF EXPERIMENT

**Abstract**

Self ReWetting Fluid is one of the experiments selected for the Heat Transfer Host 1 facilities, a multi-experiment research tool that will be installed in the European Drawer Rack 2 on board the International Space Station with the aim to run several scientific experiments examining heat pipe phenomena. The Self ReWetting Fluid experiment intends to study basic fluid dynamic and physic-chemical mechanisms that occur in multi-component two-phase systems, and particularly on the interplay between phase change, heat transport, surface and bulk thermo-physical processes occurring in evaporation-based heat transfer devices, like heat pipes. The experiment is aimed at comparison of heat transfer performances of systems involving phase change, including binary mixtures with an anomalous behavior of the surface tension named self-rewetting fluid, and conventional single-component liquid. Development of Self ReWetting Fluid experiment requires considerable advancement in modeling of two-phase flow, where several physical mechanisms involving heat and mass transfer of multicomponent system, phase change, capillary phenomena and thermocapillary effects are strictly interconnected. In this work, the microgravity experiment is described including the main advancement in the flight hardware development. Then, numerical analysis of the two-phase flow is carried out by means of a CFD code were evaporation and condensation processes are included considering the kinetic theory. Typical experimental conditions foreseen on board the International Space Station are considered. In particular, evaporator and condenser sections are kept at two different temperatures enabling heat and mass transfer processes between the opposite sides of the test cell. Numerical results allow the prediction of the typical flow field occurring in microgravity conditions as well as the heat transfer coefficient due to the evaporation/condensation process. Results are discussed.