
Contribution ID: **35** Type: **Poster Presentation**

# Theoretical research of helium pulsating heat pipe under steady state

*Monday, June 29, 2015 2:00 PM (2 hours)*

As a new-type heat pipe, pulsating heat pipe (PHP) has several outstanding features, such as great heat transport ability, strong adjustability, small in size and simple construction. PHP is a complex two-phase flow system associated with many physics subjects and parameters, which utilizes the pressure and temperature change in volume expansion and contraction during phase changes to excite the pulsation motion of liquid plugs and vapor bubbles in capillary tube between the evaporator and condenser. At the present time, some experimental investigation of helium PHP have been done. We developed a mechanical-thermal switch working as a novel pre-cooling system for the helium PHP, and the measured effective thermal conductivity of helium PHP was 16760 W/m·K with a heating power of 49.2 mW. However, theoretical research of helium PHP is rare. In this paper, the physical and mathematical models of operating mechanism for helium PHP under steady state are established based on the conservation of mass, momentum, and energy. Several important parameters are correlated and solved, including the filling ratio, advanced and receded contact angles of the liquid helium, flow velocity, and temperature etc. Based on the results, the operational driving force and flow resistances of helium PHP are analyzed, and the flow and heat transfer are further studied.

**Primary author:** Dr XU, Dong (Technical Institute of Physics and Chemistry of the Chinese Academy of Sciences)

**Co-authors:** Dr LIU, Huiming (Technical Institute of Physics and Chemistry of the Chinese Academy of Sciences); Prof. LI, Laifeng (Technical Institute of Physics and Chemistry of the Chinese Academy of Sciences); Prof. HUANG, Rongjin (Technical Institute of Physics and Chemistry of the Chinese Academy of Sciences)

**Presenter:** Dr LIU, Huiming (Technical Institute of Physics and Chemistry of the Chinese Academy of Sciences)

**Session Classification:** C1PoJ - Novel Concepts and New Devices I

**Track Classification:** CEC-12 - Fluid Mechanics, Heat Transfer, and Cryogen Properties