



Contribution ID: 299

Type: **Poster presentation (105min)**

Transient heat transfer from a wire inserted into a vertically-mounted pipe to a forced flow of liquid hydrogen

Thursday, 10 July 2014 10:30 (2h 15m)

Liquid hydrogen has been used as a fuel for a rocket engine and moderator material for cold neutron source. Recently, it is expected as a coolant for high-Tc superconducting devices because of its excellent cooling properties. The knowledge of transient heat transfer in forced flow of liquid hydrogen is necessary for the cooling design. However, there have been no experimental data on the transient heat transfer in liquid hydrogen as far as we know. In this work, transient heat transfer from a wire inserted into a vertically-mounted pipe to forced flow of liquid hydrogen was measured by exponentially increasing heat input, $Q = Q_0 \exp(t/T)$ where t is time and T is period. The Pt-Co wire heater has a diameter of 1.2 mm and a length of 120 mm and is inserted into the pipe with a diameter of 8.0 mm, which is made of Fiber reinforced plastic due to thermal insulation. With increase in the heat flux up to the onset of nucleate boiling, surface temperature increases along the curve predicted by Dittus-Boelter correlation for longer period, where it can be almost regarded as steady-state. For shorter period, the heat transfer becomes higher than Dittus-Boelter correlation. In nucleate boiling regime, the heat flux steeply increases up to the transient DNB (departure from nucleate boiling) heat flux, which becomes higher for shorter period. Effect of flow velocity and period on the transient DNB heat flux was clarified.

Primary author: TATSUMOTO, HIDEKI (Japan Atomic Energy Agency)

Co-authors: Dr KOBAYASHI, Hiroaki (JAXA); YONEDA, Kazuya (Kyoto University); Prof. SHIOTSU, Masahiro (Kyoto University); Prof. SHIRAI, Yasuyuki (Kyoto University); Prof. INATANI, Yoshifumi (JAXA); Dr NARUO, Yoshihiro (JAXA); HORIE, Yuki (Kyoto University)

Presenter: TATSUMOTO, HIDEKI (Japan Atomic Energy Agency)

Session Classification: Thu-Mo-Posters Session 3.3

Track Classification: C-06: Heat transfer and thermo-physical properties of solids and fluids