Safety Precautions:
Please make sure all the equipment is in safe condition before and after conducting the experiment.

Objectives:

1. To determine the critical heat flux of non-treated sample.
2. To determine the burnout condition of the same sample.

Introduction:

Nucleate pool boiling is known to be very effective mechanism of phase change heat transfer to achieve a much higher heat transfer coefficient than a single phase at a given temperature difference condition. In the nucleate boiling regime, bubbles are produced from the heat-generating surface, and the heat is rapidly transferred by their latent heat transport and local convection enhancement. However, the nucleate boiling regime is limited by a certain heat flux condition, the so-called critical heat flux (CHF).

The CHF is a maximum heat flux value to sustain the nucleate boiling regime. After the CHF point, the heated surface is covered with the vapor film, and the surrounding liquid is not able to touch the heated surface. Hence, the heat transfer mode changes from nucleate boiling to transition boiling and eventually film boiling. In such a case, it leads to dramatic decrease in the heat transfer performance and a sudden increase in the surface temperature, and consequently results in the failure of the heater surface.

Direct Joule heating method is used. This method easily supplies steady state heat flux and exhibits fast thermal response. Applied heat flux can be calculated using the Joule's heat flux equation, Equation 2.1

$$q'' = \frac{\text{Power}}{\text{Heated Area}} = \frac{VI}{WL} \tag{2.1}$$

where, V is the measured voltage drop across the test material, I is the measured current, W is the width of the heat transfer area, and L is the heated length. Uncertainty of the measured heat flux is estimated at 5.2% based on the propagation of error method.

Deliverables

Your report should include the background description of the experiment, objectives, procedures, data collected, results calculated, discussions and conclusion. Include the video and pictures of the burnout event. Hand in your work in a zip file containing all relevant files.