Topic - Correlations in boiling

Heat Transfer Correlations in Pool Boiling

- Boiling regimes differ considerably in their character

  → different heat transfer relations need to be used for different boiling regimes.

- In the *natural convection boiling* regime heat transfer rates can be accurately determined using natural convection relations.

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Heat Transfer Correlations in Pool Boiling – Nucleate Boiling

- No general theoretical relations for heat transfer in the nucleate boiling regime is available.
- Experimental based correlations are used.
- The rate of heat transfer strongly depends on the nature of nucleation and the type and the condition of the heated surface.
- A widely used correlation proposed in 1952 by Rohsenow:

$$q_s'' = \mu_l h_{fg} \left[\frac{g(\rho_l - \rho_v)}{\sigma} \right]^{1/2} \left(\frac{c_{p,l} \Delta T_e}{C_{s,f} h_{fg} \mathrm{Pr}_l^n} \right)^3$$

Heat Transfer Correlations in Pool Boiling – Nucleate Boiling

- The values in Rohsenow equation can be used for *any geometry* since it is found that the rate of heat transfer during nucleate boiling is essentially independent of the geometry and orientation of the heated surface.
- The correlation is applicable to *clean* and relatively *smooth* surfaces.
- Error for the heat transfer rate for a given excess temperature: 100%.
- Error for the excess temperature for a given heat transfer rate for the heat transfer rate and by 30%.

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