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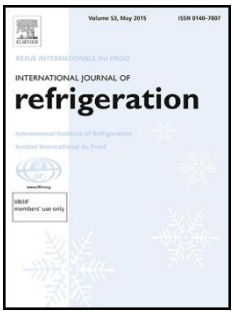


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# UNIFIED CORRELATION FOR HEAT TRANSFER DURING BOILING IN PLAIN MINI/MICRO AND CONVENTIONAL CHANNELS

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**Revision 2**

## HIGHLIGHTS

- Presents a new correlation applicable to both macro and mini/micro channels.
- Correlation verified with 4852 data points from 137 data sets from 81sources.
- Data include 30 fluids, diameter 0.38 to 27.1 mm, reduced pressure 0.0046 to 0.787.
- Mean absolute deviation 18.6 %, much lower than other correlations.

## ABSTRACT

A correlation is presented for predicting heat transfer coefficients during saturated boiling prior to critical heat flux in mini/micro channels as well as channels of conventional sizes in horizontal and vertical upwards flow. The correlation is verified with a database that includes channels of various shapes (round, rectangle, triangle), fully or partially heated, horizontal and vertical downflow, diameters 0.38 to 27.1 mm, 30 fluids (water, $CO_2$, ammonia, halocarbon refrigerants, organics, cryogens), reduced pressure 0.0046 to 0.787, and mass flux 15 to 2437 kg $m^{-2}s^{-1}$. The new correlation predicts the 4852 data points from 137 data sets from 81 sources with a mean absolute deviation of 18.6 %. Several other correlations were also compared with the same database; all had significantly higher deviations.

## Key Words

Boiling; heat transfer; minichannels; macrochannels; prediction; correlation

## NOMENCLATURE

AR Aspect ratio of channel, width divided by height (-)

Bd Bond number = $g(\rho_L - \rho_G)D^2\,\sigma^{-1}$, (-)

Bo Boiling number = q $(G\ h_{LG})^{-1}$ , (-)

Co Convection number = $(1/x - 1)^{0.8}\,(\rho_G/\rho_L)^{0.5}$, (-)

D Inside diameter of tube, (m)