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Heat transfer correlation for flow boiling of hydrocarbon mixtures inside horizontal tubes

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Hydrocarbons and their mixtures are suitable for environment-friendly refrigerant alternatives because of their good environmental criteria and high thermodynamic performances. They are not only the natural refrigerants but also the main components of natural gas. Therefore the research on flow boiling heat transfer of the hydrocarbon mixtures is extremely important in many industrial fields. Even if there are many classic correlations which could be used to calculate them, few correlations provide an acceptable agreement in open published literature.

Based on the experimental results of the hydrocarbon mixtures(R170/R290), a modified correlation was developed earlier by Zou to predict saturated flow boiling heat transfer coefficients inside horizontal smooth tubes. The correlation was based on the asymptotic model and developed by introducing a new mixture factor from the research on pool boiling heat transfer of the mixtures. The correlation gave the total mean deviation of 16% for with experimental data. The correlation also shows the best accuracy in comparison with the experimental data on LNG by Yumei Shi et al.

In this article, the earlier correlation is further refined to predict evaporation of the hydrocarbon mixtures of LNG(such as R50/R170) inside a horizontal smooth by expanding the data base from experimental investigations. The comparisons of the present model and other classic models with the recent data are made to evaluate the mean deviation for the mixtures. The proposed model yielded the lowest mean deviations among the tested correlations.

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