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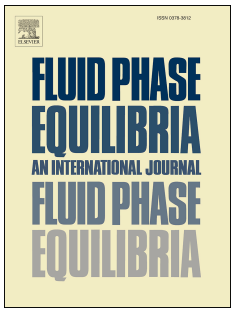

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A new corresponding-states model for estimating the vaporization heat of working fluids used in Organic Rankine Cycle

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Abstract

Organic Rankine Cycle (ORC) has been proven to be a promising solution to recover low-grade waste heat so as to improve the total energy efficiency. As one of the most important thermodynamic properties, vaporization heat has significant effect on the organic working fluid selection which considerably impacts the system efficiency, operation and environmental impact. In this paper, a simple new vaporization heat correlation is presented based on the corresponding states principle. This new proposed equation is valid throughout a large temperature range for all kinds of working fluids of different kinds used in ORC and could reproduce data with a very high degree of accuracy. 36 working fluids, classified into the polar and the non-polar according to the molecular polarity and chemical bonds, are chosen to calculate the vaporization heat to verify the new equation. The result shows that the absolute deviations of the polar and non-polar fluids are 0.78% and 0.66% respectively. In addition, a comparison between the new correlation and previous models has been made, from which it can be drawn a conclusion that this new equation presents more attractive than the existing equations because of its higher accuracy and simple format.

Key words: Vaporization heat; Organic Rankine Cycle; Working fluids; Corresponding states principle; Molecular polarity