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利用计算流体力学方法研究精馏塔板上的液相流动

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摘要 A computational fluid-dynamics model is presented for predicting the two-phase two-dimensional liquid phase flow on a distillation column tray based on the modification of Navier-Stokes Equation by considering both the resistance and the enhanced turbulence created by the uprising vapor. Experimental measurement of the local liquid phase velocity on an air-water simulator of 1.2 m in diameter by using the hot film anemometer is briefly described. Two of the conventional fluid-dynaxmic constants are readjusted for the case of liquid flow on a tray by fitting the experimental data. The predicted local liquid phase velocity and direction of flow by the present model are confirmed satisfactorily by the authors' experimental measurements and by the data from literature. By the aid of the present model, the concentration field on the tray can be computed for the evaluation of the enhancement of liquid phase concentration across a tray. The advantages of applying computational fluid-dynamics to tray column design are discussed.

关键词 computational fluid-dynamics gas-liquid two-phase flow distillation column tray fluid mechanics concentration profile

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Computational Fluid-dynamics of Liquid Phase Flow on Distillation Column Trays

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Abstract A computational fluid-dynamics model is presented for predicting the two-phase two-dimensional liquid phase flow on a distillation column tray based on the modification of Navier-Stokes Equation by considering both the resistance and the enhanced turbulence created by the uprising vapor. Experimental measurement of the local liquid phase velocity on an air-water simulator of 1.2 m in diameter by using the hot film anemometer is briefly described. Two of the conventional fluid-dynaxmic constants are readjusted for the case of liquid flow on a tray by fitting the experimental data. The predicted local liquid phase velocity and direction of flow by the present model are confirmed satisfactorily by the authors' experimental measurements and by the data from literature. By the aid of the present model, the concentration field on the tray can be computed for the evaluation of the enhancement of liquid phase concentration across a tray. The advantages of applying computational fluid-dynamics to tray column design are discussed.

Key words computational fluid-dynamics; gas-liquid two-phase flow; distillation column tray; fluid mechanics; concentration profile

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