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Slug-flow dynamics with phase change heat transfer in compact heat exchangers with oblique wavy walls[1] KENICHI MORIMOTO, HIDENORI KINOSHITA, RYO MATSUSHITA, YUJI SUZUKI, The University of Tokyo — With abundance of low-temperature geothermal energy source, small-scale binary-cycle power generation system has gained renewed attention. Although heat exchangers play a dominant role in thermal efficiency and the system size, the optimum design strategy has not been established due to complex flow phenomena and the lack of versatile heat transfer models. In the present study, the concept of oblique wavy walls, with which high j/f factor is achieved by strong secondary flows in single-phase system, is extended to two-phase exchangers. The present analyses are based on evaporation model coupled to a VOF technique, and a train of isolated bubbles is generated under the controlled inlet quality. R245fa is adopted as a low boiling-point working media, and two types of channels are considered with a hydraulic diameter of 4 mm: (i) a straight circular pipe and (ii) a duct with oblique wavy walls. The focus is on slug-flow dynamics with evaporation under small capillary but moderate Weber numbers, where the inertial effect as well as the surface tension is of significance. A possible direction of the change in thermo-physical properties is explored by assuming varied thermal conductivity. Effects of the vortical motions on evaporative heat transfer are highlighted.

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