## عنوان مقاله:

Numerical Investigation into the Effects of Orientation on Subcooled Flow Boiling Characteristics


## محل انتشار:

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## خلاصه مقاله:

The progress reached in the high heat flux systems has required the development of appropriate thermal management approaches for dissipating the high heat fluxes, especially for small-scale devices. One of the most advantageous thermal management techniques is the utilization of subcooled flow boiling. In this work, the subcooled flow boiling of FC-۷۲ is numerically simulated in a minichannel using ANSYS Fluent to investigate the effects of system pressure and gravitational orientation on the subcooled flow boiling thermal transfer performances. Two different orientations (vertical downflow and vertical upflow) were examined in the same conditions of heat flux (q = ۱۹۱۵۵۳ W/m۲), mass flux (G = ۸۳۶.۶۴ kg/(m۲s)) and inlet temperature (Tin = ۳۰۴.۵۴ K), and under three different system pressures (۱۰۲۰۰۰, ۱۲۰۰۰۰, and ۲۰۹۹۰۰ Pa). The present computational study has been validated and a good agreement with the experimental data was demonstrated. The predicted results demonstrate that the increase in system pressure improves the thermal performance of subcooled flow boiling by an average enhancement of ۱۵.۹۴%. In addition, the vertical upflow orientation is more advantageous than the downflow orientation due to the buoyancy force that moves the bubbles towards the flow direction and leads to less chaotic liquid-vapor interactions. An average enhancement of ۱.۶۵% in the heat transfer coefficient is reached in the upflow orientation compared to the downflow orientation for the higher system pressure of ۲۰۹۹۰۰ Pa.



## کلمات کلیدی:

subcooled flow boiling, upflow, downflow, heat transfer, pressure drop