# NUMERICAL SIMULATION OF TWO PHASE FLOW IN MICROCHANNEL-- HEAT EXCHANGER

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## ABSTRACT

Over the last decade, micromachining technology has been increasingly used for the development of highly efficient cooling devices called heat sink because of its undeniable advantages such as less coolant demands and small dimensions. One of the most important micromachining technologies is micro channels. Hence, the study of fluid flow and heat transfer in micro channels which are two essential parts of such devices, have attracted more attentions with broad applications in both engineering and medical problems. Aluminum multi-port microchannel tubes are currently utilized in automotive air conditioners for refrigerant condensation. Recent research activities are directed toward developing other air conditioning and refrigeration systems with microchannel condensers and evaporators. Three parameters are necessary to analyze a heat exchanger performance: heat transfer, pressure drop, and void fraction. The purpose of this investigation is the numerical investigation of void fraction and frictional pressure drop in microchannel—heat exchanger using CFD package. Two-phase pressure drop results are found to be a strong function of flow regime, mass flux, and fluid properties. For refrigerant, the results indicate a change from intermittent to an annular flow configuration as mass flux and quality levels are increased. For air-water mixtures, the results shows that annular flow is the principal flow regime for the flow conditions studied. In general, pressure drop increases when mass flux ($G$) increases. At low mass fluxes (50 and 100 kg/s.m2) and high liquid to vapour density ratios (R134a), there is a small change of pressure drop with quality.Void fraction is flow regime dependent in the range of conditions investigated.

KEYWORDS: Microchannels, two phase flow, void fraction.