INTISARI

Studi eksperimental terhadap aliran dua fasa fluida non-*newtonian* dilakukan pada sebuah *microchannel* penampang persegi dengan fitur perubahan luas penampang. Aliran dua fasa non-*newtonian* berupa *Carboxymethyl cellulose* (CMC) - 0,2% - Nitrogen, dialirkan pada *microchannel* dengan D_H= 0,8 mm pada bagian upstream dan D_H= 0,5 mm pada bagian downstream.Variasi kecepatan superfisial gas (J_G) memiliki rentang J_G= 0,26 – 7,81 m/s dan kecepatan superfisial likuid memiliki rentang J_L=0,05 – 1 m/s Aliran dua fasa *newtonian* berupa akuades - Nitrogen digunakan sebagai pembanding. Fenomena *pressure drop*, pola aliran, dan karakteristik *slug* diamati pada penelitian ini. Beberapa pola aliran yang terbentuk antara lain *slug flow, elongated – flow, slug – annular flow,* dan *churn flow.* Dari pola aliran yang terbentuk, dibuat peta pola aliran dan dibandingkan dengan penelitian terdahulu.. Untuk segi karakteristik *slug*, perubahan luas penampang mengakibatkan meningkatnya panjang dan kecepatan *slug* dari bagian *upstream* ke *downstream microchannel*. Karakteristik *slug* berupa panjang *slug* lebih tinggi pada fluida *newtonian* akuades. Kecepatan *slug* lebih tinggi pada fluida non-*newtonian* CMC 0,2%. Karakteristik *slug* tersebut dipengaruhi oleh perbedan viskositas pada kedua fluida uji. Di sisi lain, perubahan luas penampang menyebabkan *pressure drop* yang terjadi pada *downstream microchannel* meningkat lebih signifikan. Selain itu, meningkatnya nilai kecepatan superfisial likuid (J_L) diikuti dengan meningkatnya *pressure drop*. Fluida non-*newtonian* CMC 0,2% memiliki *pressure drop* yang lebih tinggi dibanding fluida *newtonian* akuades.

Kata kunci: Aliran Dua Fasa, *Microchannel*, Non-*Newtonian*, Perubahan Luas, Kontraksi, Pola Aliran, Karakteristik *Slug*, Penurunan Tekanan

ABSTRACT

Experimental studies on the two-phase flow of non-Newtonian fluids were carried out on a rectangular cross-sectional microchannel with the feature of cross-sectional area changes. Two-phase non-Newtonian flow in the form of Carboxymethyl cellulose (CMC) - 0.2% - Nitrogen, flowed in a microchannel with D_H= 0.8 mm in the upstream and D_H = 0.5 mm in the downstream. Variations in superficial gas velocity (J_G) has a range of J_G= 0.26 – 7.81 m/s and the superficial liquid velocity has a range of J_L= 0.05 – 1 m/s. Two-phase Newtonian flow in the form of aquadest - Nitrogen is used as a comparison. The phenomena of pressure drop, flow pattern, and slug characteristics were observed in this study. Some of the flow patterns formed include slug flow, elongated-slug flow, slug-annular flow, and churn flow. Based on the flow pattern formed, a flow pattern map is made and compared with previous research. In terms of slug characteristics, changes in cross-sectional area result in an increase in the slug length and slug velocity from the upstream to the downstream microchannel. Slug characteristics in the form of higher slug length is found on Newtonian aquadest fluid. The slug velocity is higher in the non-Newtonian CMC 0.2% fluid. The characteristics of the slug are influenced by the difference in viscosity of the two test fluids. On the other hand, the change in cross-sectional area causes the pressure drop that occurs in the downstream microchannel to increase significantly. In addition, the increase in the value of the liquid superficial velocity (J_L) is followed by an increase in the pressure drop. Non-Newtonian CMC 0.2% fluid has a higher pressure drop than aquadest Newtonian fluid.

Keywords: Two-Phase Flow, Microchannel, Non-Newtonian, Change of Area, Contraction, Flow Pattern, Slug Characteristics, Pressure Drop