INTISARI

Studi eksperimental aliran dua fasa pada saluran *microchannel* dilakukan terhadap karakteristik pola aliran untuk fluida *newtonian* dan perbandingannya secara spesifik dengan fluida *non-newtonian* untuk karakteristik pola aliran yang terbentuk. Setelah itu, dilakukan pengamatan pada karakteristik pola aliran yang terbentuk pada fluida *non-newtonian* yang sama namun dibedakan konsentrasinya hingga mempunyai variasi *properties* reologi signifikan. Saluran *microchannel* berpenampang persegi dengan ukuran 0,8 mm x 0,8 mm dilewati oleh fluida kerja cairan *newtonian* berupa Air dan *non-newtonian* berupa *Carboxymethyl Cellulose* (CMC) konsentrasi 0,2% serta 0,4% dengan nitrogen sebagai fluida kerja gas. Kecepatan superfisial cairan yang digunakan adalah pada rentang J_L= 0,05 – 1 m/s dan gas J_G = 0,07 − 8,594 m/s. Karakteristik pola aliran yang terbentuk dianalisis menggunakan high speed camera serta mendapatkan pola aliran *bubbly*, *slug*, *slug-churn*, *churn*, *wavy-annular*, dan *slug-annular*. Peta pola aliran yang dihasilkan memiliki kesesuaian yang cukup baik terhadap penelitian terdahulu. Karakteristik *slug* seperti frekuensi kemunculan, panjang, dan kecepatan dianalisa dengan membandingkan fluida kerja Air dan CMC (0,2% dan 0,4%) serta pengaruh variasi J_G dan J_L menggunakan metode *image processing* dengan aplikasi MATLAB R2021a. Pola aliran yang teridentifikasi adalah *bubbly*, *slug*, *slug-churn*, *churn*, *wavy-annular*, dan *slug-annular*. Karakteristik *slug* seperti geometri dan waktu pembentukan dianalisa dengan membandingkan fluida kerja Air, CMC 0,2%, dan CMC 0,4% serta pengaruh variasi J_G dan J_L. J_L memiliki pengaruh yang lebih signifikan dibandingkan J_G pada gradien penurunan tekanan. Konstanta korelasi (C) akan memberikan persentase eror berbeda dalam memprediksi gradien penurunan tekanan aliran dua fasa sesuai dengan parameter yang mempengaruhinya.

Kata Kunci : Aliran Dua Fasa, *Microchannel*, Pola Aliran, Fluida *Newtonian*, Fluida *Non-Newtonian*, Properti Reologi, Viskositas.

ABSTRACT

Experimental studies of two-phase flow in microchannels were carried out on the characteristics of the flow pattern for Newtonian Fluids and their specific comparison with non-Newtonian Fluids for the characteristics of the formed flow patterns. After that, observations were made on the characteristics of the flow pattern formed in the same non-Newtonian fluid but differing in concentration so that it had significant variations in rheological properties. The microchannel with a square cross section with a size of 0.8 mm x 0.8 mm is passed by the Newtonian fluid working fluid in the form of water and non-Newtonian in the form of Carboxymethyl Cellulose (CMC) with 0.2% concentration and 0.4% with nitrogen as the gas working fluid. The superficial velocity of the liquid used is in the range of J_L= 0.05 – 1 m/s and gas J_G = 0.07 8.594 m/s. The characteristics of the flow pattern formed were analyzed using a high-speed camera and obtained the flow patterns of bubbly, slug, slug-churn, churn, wavy-annular, and slug-annular. The resulting flow pattern map has a good match with previous research. Slug characteristics such as frequency of occurrence, length, and speed were analyzed by comparing the working fluids of water and CMC (0.2% and 0.4%) and the effect of JG and JL variations using the image processing method with MATLAB R2021a. The identified flow patterns are bubbly, slug, slug-churn, churn, wavy-annular, and slug-annular. Slug characteristics such as geometry and formation time were analyzed by comparing the working fluids of Water, CMC 0.2%, and CMC 0.4% and the effect of J_G and J_L variations. J_L has a more significant effect than J_G on the pressure drop gradient. The correlation constant (C) will give a different percentage of error in predicting the pressure drop gradient of the two-phase flow according to the parameters that affect it.

Keywords : Two-Phase Flow, Microchannel, Flow Pattern, Newtonian Fluid, Non-Newtonian Fluid, Rheological Properties, Viscosity.