

INTISARI

Studi eksperimental aliran dua fasa pada *microchannel* dilakukan terhadap karakteristik pola aliran untuk fluida *newtonian* dan perbandingannya secara spesifik dengan fluida *non-newtonian* untuk karakteristik pola aliran slug. Saluran *microchannel* berbentuk *square* dengan ukuran 0,8 mm x 0,8 mm dilewati oleh fluida kerja cairan *newtonian* berupa Aquadest dan *non-newtonian* berupa *Carboxymethyl Cellulose* (CMC) dengan nitrogen sebagai fluida kerja gas. Kecepatan superfisial cairan yang digunakan adalah pada rentang $J_L = 0,1 - 1 \text{ m/s}$ dan gas $J_G = 0,07 - 8,594 \text{ m/s}$. Karakteristik pola aliran dianalisis dengan untuk fluida kerja Aquadest dengan menggunakan *high speed camera* yang 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 Aquadest dan CMC dan pengaruh variasi J_G dan J_L menggunakan metode *image processing* dengan aplikasi MATLAB R2021a. Frekuensi *slug* pada CMC meningkat seiring bertambahnya nilai J_G hingga titik tertentu saat viskositasnya berubah dan frekuensi menurun drastis seperti Aquadest. Viskositas CMC yang lebih kental membuat panjang *slug* lebih pendek dan kecepatan *slug* lebih tinggi dibandingkan dengan Aquadest. Pada pengujian fluida Aquadest, peningkatan J_L berbanding lurus dengan frekuensi kemunculan tetapi berbanding terbalik dengan panjang *slug*. Sedangkan, kecepatan *slug* berbanding lurus terhadap peningkatan J_G maupun J_L .

Kata Kunci : Aliran Dua Fasa, *Microchannel*, Pola Aliran, *Newtonian*, *Non-Newtonian*, Karakteristik *Slug*, 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 comparison with non-Newtonian fluids for specific characteristics of slug flow patterns. The microchannel in the form of a square with a size of 0.8 mm x 0.8 mm is passed by the Newtonian fluid in the form of Aquadest and non-Newtonian in the form of Carboxymethyl Cellulose (CMC) with nitrogen as the gas working fluid. The superficial velocity of the liquid used is in the range of $J_L = 0,1 - 1 \text{ m/s}$ and gas $J_G = 0,07 - 8,594 \text{ m/s}$. The characteristics of the flow pattern were analyzed for Aquadest working fluid using a high speed camera which obtained a bubbly, slug, slug-churn, churn, wavy-annular, and slug-annular flow pattern. The resulting flow pattern map has a fairly good match with previous research. Slug characteristics such as frequency of occurrence, length, and speed were analyzed by comparing the working fluid of Aquadest and CMC and the effect of J_G and J_L variations using the image processing method with the MATLAB R2021a application. The slug frequency in CMC increases with increasing J_G value up to a certain point when the viscosity changes and the frequency decreases drastically like Aquadest. The thicker CMC viscosity makes the slug length shorter and the slug speed higher than the Aquadest. In the Aquadest fluid test, the increase in J_L is directly proportional to the frequency of occurrence but inversely proportional to the slug length. Meanwhile, the slug speed is directly proportional to the increase in J_G and J_L .

Keyword : Two-Phase Flow, Microchannel, Flow Pattern, Newtonian, Non-Newtonian, Slug Characteristics, Viscosity