Paper ID: A117

Organic Polymers as Additives in Enhancement of Laminar Liquid Flow in Microchannels

Fiona W.M. Ling [1], J.T. Heng [1] , Hayder A. Abdulbari [1]*

[1] Centre of Excellence for Advanced Research in Fluid Flow (CARIFF), Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia.
**Corresponding author: fionalingwm@gmail.com*

EXTENDED ABSTRACT

Drag reduction has been widely incorporated into various applications by introducing a minute amount of long chain flexible polymers into the core of the fluid flow in pipes, ducts and conduits. Recently, this technique started to gain attention of the researchers to be applied in medical field where the flow is mostly laminar. In this present work, three organic polymers as drag reducing additives were selected to test their flow enhancement performance in the micro-flow system connected to a 100 µm straight microchannel. The additives were extracted from three different plant sources namely, okra, aloe vera and hibiscus leaves using water extraction method. Characterization of additives such as rheology analysis was conducted. The experiments were conducted using an open-loop microfluidic system connected to a straight microchannel. The flow enhancement performance was evaluated at different additives concentrations (100 to 500 ppm) using pressure measurements. The maximum flow rate increment (%FI) up to 94% was achieved using 100 ppm of aloe vera mucilage at the operating pressure of 400 mbar. This work introduces an approach in flow enhancement of laminar flow using organic polymers that could be a milestone in medical field as an alternative treatment for cardiovascular diseases.

Keywords: Drag reducing additives; Organic polymers; Mucilage; Microchannels

Acknowledgment
The authors are grateful to University Malaysia Pahang for their financial assistance.

References
[1] Pacella, J.J., et al. (2006) A Novel Hydrodynamic Approach to the Treatment of Coronary Artery Disease. European Heart Journal, 2006. 27: 2362–2369.
[2] Pribush, A., et al. (2013) The mechanism of the polymer-induced drag reduction in blood. Colloids and Surfaces B: Biointerfaces, 103: 354-359.