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Insoluble additives for enhancing a blood-like liquid flow in micro-channels*



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Abstract: This study introduces an approach for flow enhancement in the bloodstream using insoluble additives as non-degradable drag reducing agents that can replace the polymeric soluble additives. An open micro-channel liquid flow system with three different channel sizes was assembled and used to test the drag reduction performances of the solutions investigated. Three different nano-powders (with five different addition concentrations) were investigated and used to form solutions of artificial blood with blood-like rheological properties. The experimental results showed that the optimum drag reduction performance was achieved using bismuth III oxides (65%) for a 200 ppm concentration solution flowing through a 100 μm channel, while titanium IV oxides and fumed silica achieved 57 and 55% drag reduction for a 200 ppm concentration solution flowing in a 50 μm channel, respectively.

Key words: Microchannels, pressure drop, drag reduction, nano-powder additives