Abstract

The importance of fluid flow through sudden changes in the flow passage (orifices) lies in numerous industrial applications such as polymer processing, injection molding, biomedical instruments, extrusion, thermoforming etc., Current microfabrication methods mean that orifices in similarly shaped microchannels are often found in microfluidic devices. The power required to overcome the pressure drop across such orifices is often of importance. The computational fluid dynamics (CFD) model equations are used to predict the hydrodynamic behaviour of the microchannel and orifice across it. The study investigates the pressure drop of such orifice in microchannel. In this study, three-dimensional numerical calculations of fluid flow through converging and diverging microchannels for low Reynolds number incompressible Newtonian (water) and Non Newtonian (aqueous CMC solution, blood) fluids were carried out with the aim of bringing out differences between flow in uniform and non uniform passages. In the contribution reported here, numerical results for low Reynolds number incompressible fluid flow through orifice in similarly shaped micro-channel have been used to predict the pressure drop arising from the orifice for various orifice contraction ratios (γo), orifice length to diameter ratio (λo) and orifice position.

Keyword: Laminar, Microchannel, Orifice, Newtonian, Non-Newtonian, Pressure drop.