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Electroosmotic Flow of Power-Law Fluids in a Cylindrical Microcapillary M.H. SAIDI, School of Mechanical Engineering, Sharif University of Technology, ASHKAN BABAIE, Department of Mechanical Engineering, University of British Columbia, ARMAN SADEGHI, School of Mechanical Engineering, Sharif University of Technology, CENTER OF EXCELLENCE IN ENERGY CONVERSION TEAM — In biological applications where most fluids are considered to be non-Newtonian, Newtonian law of viscosity looks insufficient for describing the flow characteristics. In the present work, the electroosmotic flow of power-law fluids in a circular micro tube is investigated. The Poisson-Boltzmann equation for electrical potential is solved numerically in the complete form without using the Debye-Hückel approximation. The physical model includes the Joule heating and viscous dissipation effects. Once the momentum and energy equations are solved numerically, a parametric study is done to investigate the effects of different parameters such as flow behavior index, wall zeta potential and the Debye-Hückel parameter on thermal and hydrodynamic characteristics of the flow. Results show that based on the value of viscous dissipation and the Debye-Hückel parameter the non-Newtonian characteristics of the flow can lead to significant changes regarding to Newtonian behaviors. The provided results in this study would lead to accurate prediction of temperature of biofluids in Lab-on-a-chip devices which is vital for retaining samples in a healthy condition.

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