

In this work, we present a numerical simulation of the flow characteristics and the heat transfer mechanism of a non-Newtonian fluid in an annular space between two coaxial rotating cylinders. The Carreau stress–strain relation was adopted to model the rheological fluid behaviour. The problem is studied when the heated inner cylinder rotates around the common axis with constant angular velocity and the cooled outer cylinder is at the rest. The horizontal endplates are assumed adiabatic. The governing equations are solved using mixed finite elements method. The effects of the different parameters on the heat transfer and on the flow are examined. These parameters are the Reynolds (Re), the Grashof (Gr) and the Weissenberg numbers (We), and the flow index (n). The results of the natural, forced and mixed convections are presented and discussed. © 2006 Elsevier Ltd. All rights reserved