flows. The model has been validated against five sets of data from DNS simulations at Ret= 395 pertaining to low, intermediate and high drag reductions.


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EFFECT OF A GENERALIZED STRETCHING FLOW ON A NON-NEWTONIAN FLUID AND A BISTABLE CHEMICAL SYSTEM

M.E. Bravo-Gutiérrez1; R. Herrera1; P. Roquero1; A.E. Chávez1

1Facultad de Química, Universidad Nacional Autónoma de México, CP 04510, México DF, México

ABSTRACT

A theoretical study is presented regarding the effect of a flow field on a non-Newtonian fluid and over the bistability of a chemical reaction system. A generalized stretching flow scheme is proposed to obtain the concentration distributions and velocity gradients in order to determine the normal stress differences and other rheological properties. An analysis of the stability and deformation of a material element immersed in an isothermal laminar flow system, during a time scale related to the reactive process, is done. Mathematical techniques applied in non-linear dynamics and numerical solutions are used on different ranges of dimensionless parameters such as the Damköhler and the Péclet numbers, establishing the influence of the flow field over the chemical kinetics and other properties.

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NUMERICAL STUDY OF THE FLOW HEMODYNAMICS IN INTRACRANIAL ANEURYSMS

A. F. Silva1; M. A. Alves1; M. S. N. Oliveira2

1Centro de Estudos de Fenómenos de Transporte, Faculdade de Engenharia da Universidade do Porto, R. Dr. Roberto Frias, 4200-465 Porto, Portugal; 2Centro de Estudos de Fenómenos de Transporte (CEFT), Faculdade de Engenharia da Universidade do Porto, R. Dr. Roberto Frias, 4200-465 Porto, Portugal / Mechanical & Aerospace Engineering Department, University of Strath

ABSTRACT

Cerebral aneurysms are an abnormal dilation or deformation of cerebral arteries and are one of the most common cerebrovascular diseases. In the case of intracranial aneurysms (ICA), the dilation usually occurs at a bifurcation apex and has an extremely thin wall, which may subsequently rupture causing subarachnoid hemorrhage. There is still controversy about the source of cerebral aneurysms, but it is well accepted that the formation of aneurysms cannot be attributed to biological factors alone, but to a combined effect of biological and hemodynamic factors. Thus, the flow dynamics plays an important role in the onset, growth, and rupture of cerebral aneurysms.

Blood is considered a non-Newtonian fluid, with viscoelastic and shear-thinning characteristics. Due to the difficulties in simulating real blood characteristics it is usual to consider blood as a Newtonian incompressible fluid. However, in smaller arteries and veins this assumption may give erroneous results.

The aim of this work is to use CFD analysis to study the impact of non-Newtonian blood rheology upon flow characteristics in cerebral aneurysms to understand the relationship between hemodynamic factors, such as velocity, wall shear stress and pressure, and their impact upon the arterial walls. We simulate different flows with 2D and 3D simplified aneurysm geometries based on angiographic images. For each geometry, we perform