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Recent Trends in Jeffrey Fluid and Casson Fluid Models

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Abstract: The Voigt model is good for viscoelastic solids and not for fluids but the Jeffery's model is good for fluids and not for solids. The model is interesting because the Maxwell model is a particular case. Further, the Newtonian fluids arise from Jeffery's model when the relaxation and retardation times are equal. The examples of Jeffrey fluid are dilute polymer solutions, melting polymers etc. The non-Newtonian property of Casson fluid is responsible to diffuse the momentum through more number of fluid layers. The examples of Casson fluid are as follows: jelly, tomato sauce, honey, soup, concentrated fruit juices, etc. Human blood can also be treated as Casson fluid. Due to the presence of several substances like, protein, fibrinogen, and globulin in aqueous base plasma, human red blood cells can form a chainlike structure, known as aggregates or rouleaux.

Keywords: Jeffrey fluid, Casson fluid, Stagnation-Point, Runge-Kutta fourth order

1. Introduction

A non-Newtonian fluid model derived using time rather convected derivatives such as Oldroyd-B' model is called Jeffrey fluid model. It's constitutive equation can be derived as:

$$\frac{\tau}{\mu} = \frac{\gamma' + \lambda_2 \gamma''}{1 + \lambda_1}$$

Where $\tau, \mu, \lambda_1, \lambda_2$ and γ are defined as stress tensor, viscosity of the fluid, relaxation and retardation time ratio, retardation time, shear rate and also dashes are differentiation w.r.t time.

The main aim of Jeffrey fluid study is to find the solution (using any method i.e. it may be analytical study or numerical study) for any Jeffrey model in proper channel