Polym Sci, 3:3
DOI: 10.4172/2471-9935-C1-003

On linear instability of flows of an incompressible polymeric fluid with a strong discontinuity

Andrey Yu Goldin[1], **Andrey I Marinov**[1] and **Alexander M Blokhin**[2]
[1]Novosibirsk State University, Russia
[2]Sobolev Institute of Mathematics, Russia

Statement of the problem: Nowadays there are a lot of models which describe the behavior of flows of polymeric fluids. But, some important properties such as stability or instability of solutions for these models have been studied insufficiently. Particularly, we consider the so-called Vinogradov-Pokrovskii model using the mesoscopic approach to the mathematical modelling of polymers. The stability of a polymeric fluid at rest and the stability of a strong discontinuity are analyzed. Two different ways of realization of the state of rest are discussed: the state of rest of one fluid in a flat infinite channel and the state of rest of two fluids with different parameters separated by a strong discontinuity. Also some results on the stability of a strong discontinuity in an infinite medium with the possibility of overflowing have been obtained. Methodology: The standard Lyapunov's method is used for studying stability and instability. We derive the linearized equations of the initial system of partial differential equations. The linearization is performed with respect to the state of rest. Then, special solutions are found. Algebraic conditions for the eigenvalues, which are responsible for the time growth, can be determined by cumbersome calculations. Results: The state of rest of one fluid in a flat channel is stable to small perturbations whereas time-growing solutions are constructed and, so, instability is shown for the case of two fluids with a strong discontinuity in an infinite medium with overflowing.

Conclusion & Significance: Nowadays polymeric materials have an important role in different fields of industry and technologies. In attempts to understand their behavior we can propose and study a lot of mathematical models. Then some main properties such as stability of flows and discontinuities can be studied. According to this information modern devices and technologies based on polymeric materials can be created or improved

goldinandrey@list.ru