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# Unsteady non-isothermal and non-Newtonian flow problem with mixed boundary conditions

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## Abstract

We consider the non-stationary flow of an incompressible, non-Newtonian and non-isothermal fluid in a bounded domain  $\Omega \subset \mathbb{R}^3$ . We assume non-standard mixed boundary conditions with a given time dependent velocity on a part of the boundary and Tresca's friction law on the other part. From the latter condition, we obtain that the variational formulation of the problem is given by a parabolic variational inequality.

The originality in this work is that the fluid viscosity depends on temperature and also on the modulus of strain rate tensor and the velocity of the fluid.

We prove the existence of a solution by using Schauder fixed point theorem, the notion of semigroup and monotony methods. Then, we conclude by applying De Rham theorem to construct the pressure term.

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