

Minisymposium MS14: Numerical solution of problems arising in modeling and optimization of complex fluid mechanics problems

**NONSMOOTH EXACT PENALIZATION
SECOND-ORDER METHODS FOR INCOMPRESSIBLE
BI-VISCOUS FLUIDS**

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ABSTRACT

We consider the exact penalization of the incompressibility condition $\operatorname{div}(u) = 0$ for the velocity field of a bi-viscous fluid in terms of the L^1 -norm. This penalization procedure results in a nonsmooth optimization problem for which we propose an algorithm using generalized second-order information. Our method solves the resulting nonsmooth problem by considering the steepest descent direction and extra generalized second-order information associated to the nonsmooth term. This method has the advantage that the divergence-free property is enforced by the descent direction proposed by the method without the need of build-in divergence-free approximation schemes. The inexact penalization approach, given by the L^2 -norm, is also considered in our discussion and comparison.

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