

Modelling of highly viscous 3D flows at the pore scale

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We present a numerical iterative method for the solution of internal viscous incompressible flows in real porous bodies at their pore scale. We use the penalized formulation of the problem with velocity and vorticity fields: an operator splitting allows to separate the diffusion (which comes from Stokes equation) and the penalization phenomena (which takes into account the solid matrix).

Our method allows to deal only with standard operators, which can be managed by direct computations or FFT solver, in the spirit of vortex methods. We also expose the validation of the method on real geometries, simulation of shear-thinning flow involving heterogeneous rheology and perspectives of coupling for the simulation of more complex phenomena.

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