# Discontinuous Galerkin Discretization of Stokes Equation

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**Abstract:** Currently pore-scale modeling and simulation of multiphase flow in porous media is considered to be able to describe variety of phenomena in subsurface hydrology and closely related fields. At pore-scale, the flow is assumed to be slow and viscous dominated and can be modeled using the stationary Stokes equation.

In the present work, the discontinuous Galerkin (DG) discretization of stationary Stokes equation is considered. DG method is chosen mainly because of its several appealing properties such as flexibility and ease for parallelization over other numerical methods. There is very little literature available on DG methods for solving numerically the incompressible Stokes flows in porous media and to our knowledge, there is no comparative study available in the literature on the suitability of different DG schemes for solving the Stokes equation. The purpose of this paper is to study the two widely used DG schemes namely Interior Penalty Galerkin (IPG) and Local Discontinuous Galerkin (LDG) to solve Stokes equation at pore-scale. The numerical results are presented for a simple test problem. The challenges associated with modeling when extending to a two-phase system are also discussed.

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