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Classical solutions and stability results for Stokesian Hele-Shaw flows

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Abstract. In this paper we study a mathematical model for the motion of a Stokesian fluid in a Hele-Shaw cell surrounded by a gas at uniform pressure. The model is based on a non-Newtonian version of Darcy's law for the bulk fluid, as suggested in [9, 12].

Besides a general existence and uniqueness result for classical solutions, it is also shown that classical solutions exist globally and tend to circles exponentially fast, provided the initial data is sufficiently close to a circle. Finally, our analysis discloses the influence of surface tension and the effective viscosity on the rate of convergence.

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