The Stokes system with boundary condition involving a pressure

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Abstract

Ch. Amrouche, P. Penel, N. Seloula studied in 2013 the problem

$$-\Delta \mathbf{u} + \nabla \pi = \mathbf{F}, \quad \nabla \cdot \mathbf{u} = G \quad \text{in } \Omega,$$

$$\pi = h, \quad \mathbf{u} \cdot \tau = g \quad \text{on } \partial\Omega$$

in $W^{1,p}(\Omega, \mathbb{R}^3) \times W^{1,p}(\Omega)$ and in $W^{2,p}(\Omega, \mathbb{R}^3) \times W^{1,p}(\Omega)$ for a bounded domain $\Omega \subset \mathbb{R}^3$. (Here τ is the tangential vector on $\partial\Omega$.) We suppose that $\Omega \subset \mathbb{R}^2$ is a bounded simply connected domain and prove the unique solvability of this problem in Sobolev spaces $W^{s,p}(\Omega, \mathbb{R}^2) \times W^{t,q}(\Omega)$ with $s > 1/p$, $s + 1 \geq t > 1/q$; in Besov spaces $B_s^{p,r}(\Omega, \mathbb{R}^2) \times B_t^{q,\gamma}(\Omega)$ with $s > 1/p$, $s + 1 \geq t > 1/q$; and in $\mathcal{C}^{k+1,\gamma}(\overline{\Omega}, \mathbb{R}^2) \times \mathcal{C}^{k,\gamma}(\overline{\Omega})$.

Keywords: stationary Stokes system; pressure

References

[1] Ch. Amrouche, P. Penel, N. Seloula, *Some remarks on the boundary conditions in the theory of Navier-Stokes equations*, Ann. Math. Blaise Pascal 20 (2013) 37–73.