CHARACTERIZATION OF THE FLOW FIELD IN THE VICINITY OF SEPARATION/STAGNATION POINT

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Located at the wall, separation/stagnation point (SP) defines the limit of a vortex, respectively vortical structure. In a Newtonian flow, at SP velocity and the wall shear stress take zero value. As consequence, vorticity is zero and the flow trajectories diverge. The presence of SP is also associated with a particular pressure distribution in the flow field and the existence of a "saddle point" in the iso-pressure pattern, which corresponds to a critical pressure value, p_{cr}. Assuming that thin layer (Reynolds) approximation of Navier-Stokes equation is valid in the vicinity of SP, we conclude that the third derivative of pressure in the wall direction is also null at SP and the maximum of pressure is reached downstream SP. The pressure distribution and spectrum of vorticity number are corroborated in order to obtain a better description of the flow field at the boundary of vortical structures developed at the wall. The study is applied to micro-fluidics ("Y" and "T" micro-channels flows), where the presence of vortices are important in characterization and optimization of diffusion and mixing processes. Experimental and numerical simulation of Newtonian and viscoelastic flows in the analysed geometries are presented.