Time periodic Navier-Stokes equations in a thin tube structures motivated by hemodynamic

Rita Juodagalvytė
Vilnius University
rita.juodagalvyte@mif.vu.lt
Konstantinas Pileckas
Vilnius University
konstantinas.pileckas@mif.vu.lt
Grigory Panasenko
University Jean Monnet (Saint-Etienne), Vilnius University
grigory.panasenko@univ-st-etienne.fr

The time-periodic Navier-Stokes equations are considered in thin tube structures in three and two-dimensional settings with Dirichlet boundary conditions. A thin tube structure is defined as finite union of thin cylinders which are characterized by a small parameter ε which is the ratio of the height and the diameter of the cylinders. We consider the case of the finite or big coefficient before the time derivative. This setting is motivated by hemodynamic (small vessels). Theorems of existence and uniqueness of a solution are proved. Complete asymptotic expansion of a solution is constructed and justified. The method of asymptotic partial decomposition of the domain is justified for the time-periodic problem. The conductivity problem on the graph is solving using numerical methods. The numerical results are obtained in collaboration with Frédéric Chardard.

R. Juodagalvytė was supported by the LABEX MILYON (ANR-10-LABX-0070) of Univeristé de Lyon within the program "Investiments d'Avenir" (ANR-11-IDEX-0007) operated by the French National Research Agency.

This research is partially funded from European Social Fund (project No 09.3.3-LMT-K-712-01-0012) under grant agreement with the Research Council of Lithuania (LMTLT).