Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

In Silico Modeling of Formation and Growth of Thrombus under Blood Flow. NIKHIL JANARDAN YEWALE, SATYAJIT CHOUDHURY, B.S.V PATNAIK, Department of Applied Mechanics, Indian Institute of Technology Madras — Understanding the spatio-temporal evolution of various biochemical species is critical to simulate the initiation and propagation of pathways that lead to thrombus formation in blood vessels. A large number of species and their reactions are challenging to synthesize through the experimental means. Thus, in silico modeling of the blood clot formation serves as a useful tool. To this end, blood is assumed as a multi-constituent mixture comprising of fluid and thrombus phase, which transports various biochemical agonists and inhibitors contributing to the coagulation cascade. In this study, blood is modeled using mass and momentum conservation equations with source term to account for the resistance on the blood flow from the thrombus formed. The transport of biochemical species involved is represented with convection-diffusion-reaction equations. The injury site is subjected to a constant influx of chemical agonist. The model used in this study accounts for the embolization of clot due to shear stress. We present the CFD simulation of the growth of thrombus at the site of endothelial injury due to chemical and shear-induced activation of platelets in a straight and stenosed blood vessel. The study also highlights the influence of flow pulsatility on the growth of thrombus.

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Date submitted: 01 Aug 2019 Electronic form version 1.4