Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Multiscale Simulation for the Initial Stage of Thrombus Formation SHU TAKAGI, The University of Tokyo, SATOSHI II, Osaka University, SEIJI SHIOZAKI, RIKEN, NORIO SHIMAMOTO, KAZUYASU SUGIYAMA, YOICHIRO MATSUMOTO, The University of Tokyo — Thrombosis is regarded as one of the most important diseases, which cause the myocardial and cerebral infarctions. The thrombus formation is strongly related to the multiscale coupling phenomena from molecular scale protein-protein interaction to continuum scale in blood flow. Initially, platelets start aggregate at the injured vessel wall, where von Willebrand Factor (vWF) is attached. The Glycoprotein, GPIb-α, on platelet membrane starts showing ligand-receptor interaction with this vWF and platelets start aggregating around this spot. In the present study, multiscale coupling method is developed to simulate the initial stage of thrombus formation. In this method, the molecular scale interactions between vWF and GPIb-α is solve using the stochastic Monte Carlo simulations and the binding force at each computational cell is calculated. Then the force is directly coupled with the continuum scale simulation using finite different method. The results illustrate that fluctuation given by the motion of red blood cells plays an important role for the platelets to adhere to the injured vessel walls.

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Date submitted: 01 Aug 2012 Electronic form version 1.4