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**Superhydrophobicity to minimize thrombogenic risk on mechanical heart valves**[1] DAVID BARK, HAMED VAHABI, SANLI MOVAFAGHI, KETUL POPAT, ARUN K. KOTA, Colorado State University, LAKSHMI PRASAD DASI, The Ohio State University — A large number of prosthetic heart valves are implanted each year to treat heart valve disease, where half of the surgically replaced valves are mechanical heart valves (MHV)s. MHVs are at high risk for thrombosis and therefore require lifelong antithrombotic therapies, causing an increased bleeding risk that can lead to death. To alleviate this need, we investigate the potential of superhydrophobic surfaces in reducing the thrombotic risk. Particle imaging velocimetry and computational fluid dynamics are used to quantify shear stress in the presence of potential slip on the surface. Coagulation and cell adhesion are quantified by incubating blood under static conditions. We further evaluate a dynamic blood response in polydimethylsiloxane channels under complex shear conditions that mimic the hinge region of bileaflet mechanical heart valves, a region known to exhibit thrombosis. Overall, Shear stress is not reduced on a superhydrophobic bileaflet MHV. However, superhydrophobic surfaces significantly reduce the potential for platelet responses under static and dynamic blood flow conditions, a counterintuitive result when considering that hydrophobic surfaces are prone to protein and cell adhesion.

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