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Single Molecule Dynamics in a Model Glycocalyx JAN SCRIMGEOUR, DYLAN YOUNG, Clarkson University — The glycocalyx of endothelial cells is a hyaluronan-rich polymer brush that acts as a mechanical interface between the dynamic flow of blood through the vascular system and the endothelial cell surface, and is postulated to play an essential roll in mechano-sensing, shear flow moderation and molecular filtering. The brush is formed by long hyaluronan molecules that are extruded through the cell membrane, and is structured by the tethering of large proteoglycans, such as versican, to the hyaluronan, causing the brush to swell to a thickness in excess of 4 micrometers. This long length scale combined with the high molecular weight of the brushs constituents make the dynamics of this system accessible to particle tracking microscopy. We present a platform for the investigation of glycocalyx dynamics at the single molecule level. The platform integrates a synthetic biopolymer brush tethered to a hydrogel cushion within a microfluidic system that is capable of exposing the brush to complex pulsatile flow. Single molecule imaging allows the dynamics of individual proteoglycans within the brush to be visualized, and offers insight into the microscopic structure of this soft material interface.

Jan Scrimgeour
Clarkson University

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