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Self-Renewing Microns-Thick Biopolymer Brush Made of Hyaluronan under Active Synthesis W. WEI, Georgia Institute of Technology, J. WASHBURN, P. WEIGEL, Oklahoma University Medicine, J.E. CURTIS, Georgia Institute of Technology — Hyaluronan (HA) is a large anionic polysaccharide distributed throughout many vertebrate tissues. We introduce a technology to produce dynamic HA polymer brush interfaces. The strategy relies on the enzyme hyaluronan synthase (HA synthase), which synthesizes and extrudes HA polymers up to 20 microns in length. We show that interfaces decorated by HA synthase-rich membrane fragments robustly produce polymer brushes of predictable heights and concentration profiles. The brush thickness can be tuned by the duration of growth or the enzyme density in the membranes. The system is self-renewing in that old polymers desorb and new polymers are produced. The brush can also be replenished after enzymatic removal multiple times. The large extent of the polymer interface allows for characterization of the brush architecture and for studying dynamic processes inside the brush using optical microscopy. At low ionic strengths (1 mM), we measure one of the largest polymer brushes yet reported, an average of 7.8 microns thick. For applications that require a stable brush interface, we have covalently reinforced the HA to the surfaces, and demonstrated that the brush is stable for at least two months. This self-renewing, dynamic biopolymer brush has great potential as a new biomaterial for implants, antifouling, tissue engineering and drug delivery.

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