Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Tunable Surface Properties from Bioinspired Comb Copolymers
WENDY VAN ZOELEN, HILDA BUSS, NATHAN ELLEBRACHT, University of California, Berkeley, RONALD ZUCKERMANN, The Molecular Foundry, Lawrence Berkeley National Laboratory, RACHEL SEGALMAN, University of California, Berkeley — A modular polymer system which incorporates multiple functionalities simultaneously while keeping an identical backbone chemistry is a useful tool in determining necessary functionalities for marine antifouling properties. We have investigated the surface properties and antifouling behavior of polypeptoids, a class of non-natural biomimetic polymers based on an N-substituted glycine backbone, that combine many of the advantageous properties of bulk polymers with those of synthetically produced proteins, including controllable chain shape, sequence, and self-assembled structure. Using thiol-ene click chemistry, thiol functionalized amphiphilic peptoid sequences consisting of hydrophilic methoxyethyl and hydrophobic heptafluorobutyl side chains were attached to polystyrene-block-poly(ethylene oxide-stat-allyl glycidyl ether), creating comb-shaped molecules. Near edge X-ray absorption fine structure spectroscopy (NEXAFS) was used to study the surface characteristics as a function of peptoid length and composition. Only 20% of fluorinated groups in the peptoid were sufficient for promoting surface display of the otherwise hydrophilic PEO/peptoid comb block. Antifouling experiments with spores of the green algae Ulva indicated an influence of sequence.

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Date submitted: 09 Nov 2012 Electronic form version 1.4