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Reduction Of Bacterial Adhesion By Self-assembled Coatings Of Zwitterionic Sulfobetaine-containing Brush Polymers

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Microbially mediated rusting or the biodegradation of metals or critical materials represents an extensive dollar amount on military vehicles, may affect the sensitivity of field detection equipment, or pose a threat to the health of the warfighter. Therefore, novel material coatings that prevent the adhesion of detrimental bacteria are crucial for protecting the equipment and the warfighters who use them. To this end, we developed a series of biomimetic brush polymers, poly(oxy(11-(3-sulfonylpropyltrimethylglycinyl)undecylesterthiomethyl)ethylene-co-oxy(n-dodecylthiomethyl)-ethylene)s (PECH-DMAPSm, where m is the mol% of DMAPS (sulfobetaine) end group), that contain zwitterionic sulfobetaine groups. We demonstrated the polymers' thermostability up to 185 °C. The polymers were found to form favorably into multi-bilayer structures, always providing hydrophilic sulfobetaine end groups at the film surface. The coatings of the polymers were found to significantly suppress surface bacterial adhesion. The surface energy components of the polymer films with respect to the bacterial cells were determined. The suppression of bacterial adherence was understood in terms of surface energies and thermodynamics. The results collectively indicate that the sulfobetaine-containing brush polymers may be suitable for material coatings for CB threat mitigation by reducing bacterial contamination retention.