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Tailoring surface charge to antifouling applications

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Electrostatic interactions play an important role in adhesion phenomena particularly for bio-macromolecules and microorganisms. Zero charge valences of zwitter ions have been claimed as the key to their antifouling properties. However, due to the differences in the relative strength of their acid and base components, zwitter ionic materials may not be charge neutral in aqueous environments. Thus, their charge on surfaces should be further adjusted for a specific pH environment, e.g. physiological pH typical in biomedical applications. Surface zeta potential for thin polymeric films composed of polysulfobetaine methacrylate (pSBMA) brushes was controlled through copolymerizing zwitter ionic SBMA and cationic methacryloyloxyethyl trimethyl ammonium chloride (METAC) via surface-initiated atom transfer polymerization. Surface properties including zeta potential, roughness, free energy and thickness were measured and the antifouling performance of these surfaces was assessed. The zeta potential of pSBMA brushes was −40 mV across a broad pH range. By adding 2% METAC, the zeta potential of pSBMA can be tuned to zero at physiological pH while minimally affecting other physicochemical properties including dry brush thickness, surface free energy and surface roughness. Surfaces with zero and negative zeta potential, best resisted fouling by bovine serum albumin, *Escherichia coli* and *Staphylococcus* aureus. Surfaces with zero zeta potential also reduced fouling by lysozyme more effectively than surfaces with negative and positive zeta potential.

Biography

Guo Shanshan is currently a PhD student from the National University of Singapore.

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