Surface modification of polyaniline by a thiol-terminated poly(sulfobetaine methacrylate) for reduced bacterial and protein adhesion

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Abstract: There is a growing need for antifouling and anticorrosive surfaces in many commercial and industrial fields. Surface-modified thin films of polyaniline (PAni) have been shown to have dramatically altered surface properties, including improved antifouling resistance in some cases. Here we examine similarly functionalized nanoparticles and their incorporation into a polyurethane paint. The functionalization was achieved using the "graft from" approach of modifying the surface with an atom transfer radical polymerization (ATRP) initiator followed by polymerization of a zwitterionic monomer. Multiple grafting methods were examined in order to maximize the grafting density of our two initiators, w-mercaptoundecylbromoisobutyrate and 2-mercaptoethyl-2-bromo-2-methylpropanoate, onto the PAni backbone. Quasi-solid-state reactions, reflux reactions, and room temperature reactions in anhydrous environments were methods by which we initiated our PAni. Different molecular weights of the zwitterion sulfobetaine methacrylate (SBMA) were polymerized off of the initiated PAni so that the effect of the increasing hygroscopic chain length could be examined. This material was directly incorporated into paint in varying concentrations and with the bacteria Pseudomonas aeruginosa to evaluate its antifouling properties.