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Switchable Antibiofouling Coatings

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Marine Hydrokinetic (MHK) energy generation systems harness the energy of water as it moves and are vital in providing clean and sustainable energy. Biofouling presents a problem for these technologies as organisms cling to their surfaces, resulting in a decrease in efficiency. Coatings that ensure easy removal of organisms or prevent adhesion would ensure MHKs operate at optimal efficiency over time. A large amount of research has focused on ammonium salts and siloxane coatings, for anti-biofouling applications. Antibacterial ammonium salts containing long chain an aliphatic moiety disrupt the bacterial cell wall leading to cell death. Siloxane materials as fouling-release coatings that have a low modus and surface energy which facilitates easy removal of organisms from surfaces by the application of fluid shear stress. Our work has focused on the development of an alternative switchable type of surfactant that incorporates both antibacterial and fouling-release properties. We have been exploring the use of switchable polymers that start as sulfonium and ammonium based polymers which should have similar antimicrobial properties to established antibacterial quaternary ammonium salts. Both polymers can be transformed from antibiofouling to fouling release materials. When the polymers are switched to the fouling release form, any attached biofouling should be lifted away from the surface. Initial results will be discussed. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.