

Antimicrobial Thin Film Coatings Containing Quaternary Ammonium Surfactants

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Layer-by-layer (LbL) assembly, a technique that alternately deposits cationic and anionic materials, has proven to be a powerful technique for assembling thin films with a variety of properties and applications. The present work incorporates the antimicrobial agent cetyltrimethylammonium bromide (CTAB) in the cationic layer and uses polyacrylic acid (PAA) as the anionic layer. When the films are exposed to a humid environment, these agents diffuse out of the film, inhibiting bacterial growth in neighboring regions. Film growth, microstructure, and antimicrobial efficacy are studied here, with 10-bilayer films yielding thicknesses on the order of 2 μm . Various factors are shown to influence the antimicrobial efficacy including time, temperature, secondary ingredients, and number of bilayers. As more layers are deposited, antimicrobial efficacy is increased because more CTAB is able to diffuse throughout the film and higher amounts of antimicrobials are released. Additionally, inclusion of the cationic poly(diallyldimethylammonium chloride) (PDDA) in the cationic layer in conjunction with the CTAB increases film uniformity, and as a result antimicrobial effectiveness is enhanced. These thin films provide the ability to render a surface antimicrobial and may be useful for bandages or sterilization of disposable objects (e.g. surgical marker).

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