Effect of n-alkanethiolates on the formation of self-assembled straptavidin-biotin monolayer on a gold surface

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In an attempt to find an optimum condition for immobilization of streptavidin, self-assembled monolayers (SAMs) of biotin-terminated long-chain n-alkanethiolates (HS(CH2)nX, where n = 11, 12, and 16) and their mixtures with 11-mercaptoundecanol from solution onto the gold surfaces were prepared and characterized by a broad range of surface analytical techniques including optical ellipsometry, contact angle goniometry, X-ray photoelectron spectroscopy (XPS), and scanning tunneling microscopy (STM). Studies on wettability, composition, and film thickness of these SAMs show that the packing density of biotin-modified SAMs is affected by a number of alkyl chains of n-alkanethiols, especially even/odd numbers of alkyl chains. The film thickness and surface images of streptavidin binding to biotin-modified mixed SAMs formed from different mole fraction of solution indicate that the specific binding between streptavidin and biotin is maximized at very low mole fraction of biotin-terminated n-alkanethiolates in solution.

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