Formation and Characterization of Alkanethiol Self-Assembled Monolayers on Si (100) Surface

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Abstract

Surface modified with organic molecules is an interesting method to engineer the properties of material surface, such as hydrophobicity, surface charge and many more. The modification is not only limited to metals, but can possibly extend to semiconductor surfaces for potential organic electronic applications. In this regard, we studied the surface modification of Si (100) substrate with self-assembled monolayers of alkanethiols (ATs). The commercial n-alkanethiols solutions were employed and reacted with hydrogen-terminated Si (100) surface through ultraviolet-assisted chemical reaction in ambient condition. Monolayers of ($CH_3(CH_2)_{n-1}SH$) with chain length n = 6, 12 and 18 have been prepared and characterized in detail by water contact angle measurement, synchrotron radiation based X-ray photoemission spectroscopy, polarization dependent near-edge X-ray absorption fine structure. The spectroscopy results indicated the n-alkanethiols anchored on Si (100) surface through Si-S bond formation and the molecules formed ordered organic monolayer.

Keywords: self-assembled monolayers (SAM), X-ray photoemission spectroscopy (XPS), near-edge X-ray absorption fine structure (NEXAFS).