Surfacecharacteristics of Self-Assembled Monolayers Forming of Carbon and Fluorine inAlkyl Chain length

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Self-assembledmonolayers (SAM) allow simple and easy manipulation of solid surfaceproperties. A SAM consists of a head part, an alkyl chain part, and afunctional part. The head part is bound to a solid substrate through a hydrolysisreaction and dehydration-condensation reaction, the alkyl chain part forms amonolayer aligned by the van der Waals interaction of the long chains of SAM,and the functional part has a functional group. Among the three parts of SAM,we investigated the properties of the alkyl chain in this study.(3,3,3-trifluoropropyl)-trimethoxysilane(CF3(CF2)(CH2)2Si(OC2H5)3), having theshortest chain length, showed the smallest contact angle.Heptadecafluoro-(1,1,2,2-tetrahydrodecyl)triethoxysilane (CF3(CF2)7(CH2)2Si(OC2H5)3),having the longest chain length, showed the largest contact angle. Thisindicated that SAM with a longer chain length was more hydrophobic. The SAMwith the shortest chain length showed a disordered molecular arrangement due toa weak van der Waals interaction. The SAM with the longest chain length showedgood molecular arrangement due to a strong van der Waals interaction. However,when the film was formed sufficiently, the contact angle was not greatlydependent on the chain length. The slight difference in the contact angle wasconsidered to be the result of the offset between the carbon and fluorine inthe middle of the alkyl chain. The interfacial properties of SAM depending on the alkyl chain length was investigated indetail.