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Effect of Island Size on the Packing Density in the Early Stages of Alkylsilane-Based Monolayer Self Assembly

이보현, 박미현, 박지영, 성명모
국민대학교 화학과

The early stage of the self assembly for octadecyltrichlorosilane (OTS)-based monolayers is investigated using atomic force microscopy (AFM). Height measurements using AFM prove that the island height of the monolayers gradually increases with increasing the island size, and is close to the limiting value (h=~25 Å) after d=~700nm in size. Since the theoretical length of a covalently bound OTS molecule is 26.2 Å, the limiting value of the island height means that the islands with d≥700nm in size consist of close-packed, fully extended chains. The heights for the islands with d<700nm in size are lower than the limiting value and decrease with decreasing the islands sizes. This observation indicates that the OTS molecules in the small islands are less densely packed and the packing densities of the islands increase as the islands grow in size.