SELF-ORGANIZATION OF LONG-CHAIN ALIPHATIC MOLECULES AND THEIR DERIVATIVES ON ATOMICALLY FLAT SURFACES

Ya.Yu. Lopatina, A.I. Senenko, A.A. Marchenko, A.G. Naumovets

Institute of Physics, Nat. Acad. of Sci. of Ukraine
(*46, Nauky Ave., Kyiv 03680, Ukraine; e-mail: marchenko_ al@yahoo.com*)

S u m m a r y

Using the scanning tunneling microscopy, it is found that the structural organization of n-alkane molecules n-C_nH_{2n+2} ($n = 10 \div 50$) on the reconstructed Au(111) surface varies nonmonotonically, as the length of a molecule changes. The nonmonotonic character of the adsorption reveals itself in the alternation of packing types, dependence of the monolayer stability on n, and modification of surface properties. In the framework of the proposed one-dimensional model, it is shown that the correlation between the structure of adsorbed monolayers and the length of molecules is caused by a mismatch between the periods of the alkyl chain and the Au(111) surface along the $\langle 110 \rangle$ direction. The one-end functionalization of n-alkane molecules due to the chemically active –SH (n-alkanethiols) or –COOH (n-acids) group is demonstrated to result in the formation of a brush-like structure with " vertical" geometry of the adsorption, in which the anchoring of molecules at the surface occurs owing to the formation of covalent bonds.