Study of Langmuir-Blodgett Films based on Brush Polymers Containing Magnetite Nanoparticles

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Molecular brushes (brush polymers) are attracting a great interest due to their scientific and technological importance. On the one hand the synthesis and investigation of brush polymers are applied for the development of novel material, such as modified membranes and biomimetic materials, supersoft elastomers. On the other hand brush polymers can be used as templates for preparation of inorganic nanoparticles or nanowires with good colloid stability, and also as drug delivery systems [1]. Molecular brushes are composed of a flexible backbone and densely grafted side chains, which allows to provide various practically important properties such as solubility in a wide range of solvents, polyelectrolyte properties, nonlinear optical properties, thermal and pH-sensitivity, etc. [2]. In this paper we report that we have produced Langmuir-Blodgett monolayers based on the polyimide brush polymers, created by atom transfer radical polymerization (ATRP) method [3], and nanocomposite of brush polymers containing magnetite nanoparticles (fig. 1). The synthesis of magnetite nanoparticles was performed using the reaction setup described in detail in paper [4]. Langmuir monolayers based on the polyimide brush polymers with and without magnetite nanoparticles were formed at the air/water interface and transferred onto solid substrates at various values of surface pressure (0.5 mN/m, 10 mN/m, 25 mN/m) by Langmuir-Schaeffer method. In this paper the morphological changes of brush polymer monolayers and nanocomposite monolayers with hydrophobic magnetite nanoparticles at the different surface pressure were investigated by atomic force microscopy.

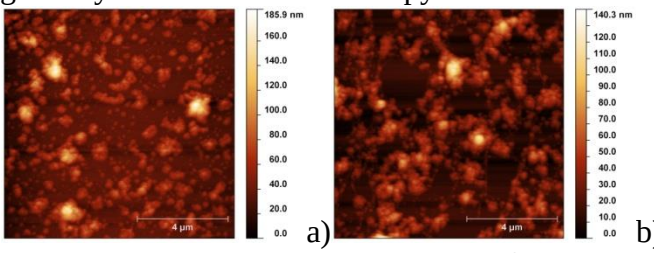

Fig. 1. AFM height images (scan area 10x10 µm^2) of the monolayer of brush polymers with short (a) and long (b) side chains, containing magnetite nanoparticles in 1:2 ratios of aliquot solutions transferred on mica surface under surface pressure SP = 25 mN / m (a condensed phase).

References.

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