Nanocomposites and nanomaterials
A structure of the adsorbed layer of nanosilica- N-methyl-4-benzylkarbamidopirydyne (amizon) nanocomposite

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Enteral drug administration provides the way of introduction of the drug through different parts of the gastrointestinal tract. Nowadays it is considered as the easiest and most convenient route of drug delivery. In the terms of good bioavailability of drugs through oral administration good hydrophilic properties and high permeability of active compounds have a crucial role, but large lipophilic and poorly water-soluble molecules are still used resulting in the challenges during the oral delivery. Based on aforementioned, approaches for enhancement of solubility are of a great importance in drug delivery development, one of which is a method of silica-based solid dispersions, when one component in the form of insoluble tiny particles is distributed among the particles of another one [1]. Use of amorphous nanoscale silica as a promising carrier for poor water soluble drugs is possible because of the ability of silica to change the properties of the water on the boundary between silica nanoparticles and surrounding environment. It was previously shown that weakly associated clusters of the water can be formed on the border of nanosilica with hydrophobic environment. Compared with bulk water it can be equally permeable for polar and nonpolar organic molecules. Thus, the conditions to accelerate the mass transfer processes at the cell-particle interface which may be responsible for the bioactivity of nanoparticles are created [2-5].
The state of boundary water in the solid dispersion, prepared by mechanical immobilization of N-methyl-4-benzilkarbamidopiridine iodide on the surface of Silica A-300 (Si/BCP solid dispersion) was studied by low-temperature 1H NMR spectroscopy and XRD analysis in a current investigation. Research revealed that BCP entered an amorphous state during the process of mechanical immobilization. It was established that water on the Si/BCP solid dispersion surface generates different types of clusters depends on the addition of augmented solvents with different polarity. It was discerned that the solubility of strong acids in nanoscale clusters of water was significantly lower than in bulk water and varied in accordance with the size and structure of clusters. But in the presence of polar solvent solubility of water clusters drastically increased. The clustering of the water and solvents placed on the solid dispersion surface are hoped to be useful in

the better understanding of a dissolution profile and another pharmacokinetic parameter of the Si/BCP solid dispersion, for example, interaction of the drug with components of gastric juice, and further drug development as well.

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