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Gemini surfactant as effective agents for delivery of nucleic acids

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To be considered for medical applications, the drug delivery systems should be effective and nontoxic. Conventionally, such systems are comprised of therapeutic substances (drug molecules, proteins, genes) encapsulated within a carrier. When dealing with genes, many macromolecules like viruses, polymers and lipids have already been tested as potential carriers, but recently, due to their advantages like increased surface activity or reduced toxicity, a diverse group of gemini surfactants turned up to be a promising type of carriers for nonviral gene delivery systems [1-3].

This study was performed on mixed systems, composed of DNA and gemini surfactants, namely alcoxyderivatives of bis-imidazolium quaternary salts with different length of hydrophobic side-chains. Their ability to bind nucleic acids was tested on three types of DNA with different sizes, i.e. 21 bp, 200 bp and 20 kbp.

The synchrotron radiation small angle X-ray scattering (SAXS) measurements were performed in DESY, Beam Line X33 (EMBL Outstation Hamburg, Germany) [4]. To gain additional structural information, the atomic force microscopy and circular dichroism spectroscopy were also applied.

Results of structural studies have allowed us to assess the connection between the geometry of gemini surfactant, composition of binary systems and formed nanostructures.

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P-08

Novel nanocomposites created by $Cu(hfa)_2$ and $Co_2(CO)_8$ via Focused-Electron-Beam-Induced-Deposition

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The new type of materials containing nanocrystals of Co and Cu have been fabricated via Focused-Electron-Beam-Induced-Deposition (FEBID). In this method the precursor gas molecules are introduced into the electron microscope chamber by Gas Injection System, where being physisorbed onto the substrate surface, they are dissociated upon the interaction with electron beam. This nanolithography technique allows to fabricate 3D structures in one single step with a regular resolution of 10nm [1]. The composition of such materials depends on the beam settings, e.g. beam size, electron flux and the scanning parameters, e.g. dwell time, pitch point, etc. [2].

In this work two precursor gases: $Cu(hfa)_2$ and $Co_2(CO)_8$ were simultaneously co-injected into the electron microscope chamber (see Figure 1). A series of squared deposits (3um x 3um) with different dwell times: 1us, 10us, 100us, 1ms, but constant dose, have been obtained.

The fabricated structures s have been preliminary analyzed with TEM, EDX, AFM techniques. The results showed that composition and deposit height depend on the chosen dwell time. Further analysis of local structure and magnetic properties by means of X-ray micro-spectroscopy techniques is planned. Assessment of the results expected, based on theoretical modeling of XAS and XMCD spectra, will be discussed.

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