Understanding of conjugated polyelectrolytes - DNA interactions based on sequential analysis of AFM imaging

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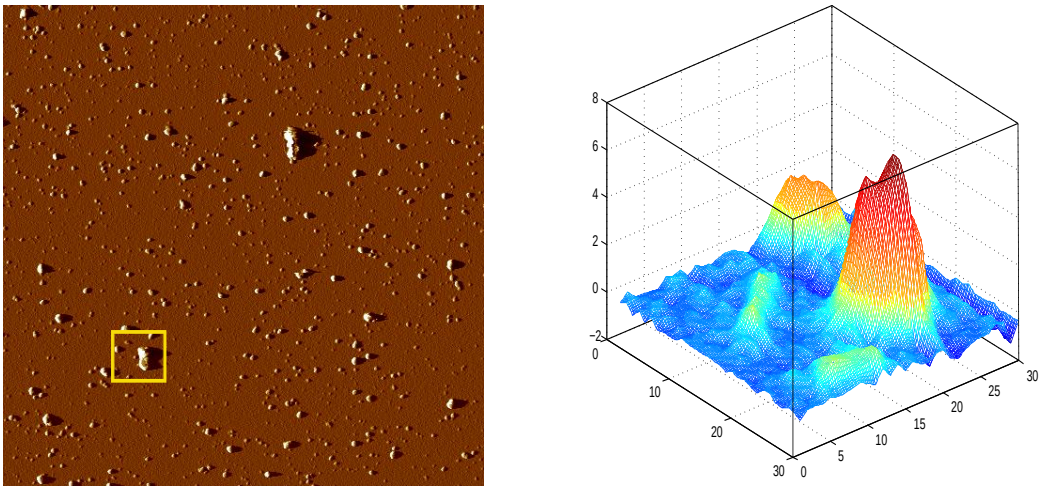
Biomolecular image analysis creates new perspective for scientific community of chemists, biophysicist and computer scientists. Data processing changes our understanding about functioning of biosensing devices, which can be used for biological and medical applications. There is a profound need in understanding of self-organization of conjugated polyelectrolytes (CPEs) with other biomolecules such as DNA. Polymers like CPE are water-soluble structures that combine the semiconducting and light harvesting properties and have been used for fluorescence sensing. Here we developed a software tool that is able to reconstruct topological images in sequential fashion to provide precise statistical data about the composition of aggregations. Atomic Force Microscopy has been used to analyze process of polymer-DNA assemblies formation (Fig. **??**). In this communication we present novel image analysis and processing approach to AFM scanning data. Proposed technique is able to reconstruct topological images (Fig. **??**) in sequential fashion to provide precise statistical data about the composition of aggregations.

Developed algorithm is based on multistage thresholding and mathematical morphology methods. Multistage threshold allows us to segment multi-scale objects observed in AFM images. Subsequently, morphological image reconstruction provides us a way to obtain topological description of observed polymers and polymer-DNA complex. This image decomposition led us to better understand of the process of polymer-DNA formation and provide inside into the structure of deposited biomaterial.



(a) (b)

Fig. 1. AFM imaging of polymer-DNA interaction process (a) and graphical representation of selected region (b).

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