BIOLOGICAL APPLICATION OF NANO-SCALE IMAGING AND SINGLE-MOLECULE MANIPURATION TECHNIQUES

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We have been using atomic force microscopy (AFM) for studying the structural organization and dynamics of various biological macromolecules and assemblies [1-5]. Here we shall summarize our most recent results using AFM.

The topics include: (1) Similarities and differences between the eukaryotic and prokaryotic genome organizations in cells. (2) Importance of the topology controls of DNA in architecturing the higher-order structures. (3) Application of fast-scanning AFM to the analyses of enzyme reaction. (4) Development of a novel method for a site-specific attachment of any glutathione S-transferase (GST)-fused proteins to the cantilever in a desired direction, which allows the applications to the measurement of interaction between chromatin and inner nuclear membrane proteins such as the lamin B receptor (LBR). (5) Successful application of the PicoTrec™ mode that can simultaneously obtain a topographic image together with a recognition signal by using protein- (antibody-) coupled cantilever (recognition imaging). Using the PicoTrec™ mode combined with our GSH- and antibody-cantilevers, we could detect specific interactions between LBR and chromatin, and between DNA and nuclear matrix proteins such as SP120.

[References]