Measuring the mechanical properties of biomacromolecules

Giovanni Dietler

Laboratory of the Physics of Living Matter, Institute of Complex Matter Physics, Ecole Polytechnique Fédérale de Lausanne (EPFL), BSP, CH-1015, Lausanne, Switzerland

The Atomic Force Microscope (AFM) is an ideal tool to study biomolecules in their natural environment at the single molecule level. Here we present the determination of the mechanical properties of proteins by AFM. First, the force - extension curve for few protein complexes (bovine serum albumine (BSA)-antiBSA, fibrin-fibrin) will be presented. In the second part, a new method that uses small vibrations of the force sensor to determine the spring constant as a function of the extension of a protein will be illustrated and examples of measurements on Bovine Serum Albumine, fibrinogen, and sugar complexes will be given. With these experiments we are able to determine the spring constant of a single biomolecule. Finally, an application of the spring constant determination to study the interaction between proteins is presented. The spring constant measurement is used to keep the pulling force on the interacting proteins constant while the life time of the bond is measured. It was possible to show that the life time of the bond depends exponentially on the pulling force and that this methods could provide new insights into the energy landscape of a system of interacting proteins or potentially also for the unfolding path of a protein.

E-Mail: Giovanni.Dietler@epfl.ch Website: http://lpmv.epfl.ch