Poster contribution

Mechanical properties of systems with biological interest: The human Immunoglobulin G.

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The antibodies are the first line of differentiated defense mechanism of our body. A better understanding of the mechanical properties of such structures would allow us to use this information as an extremely accurate diagnostic tool. The method we rely on to obtain such detailed information is the multi-frequency atomic force microscopy (AFM)[1]. The AFM has several features that are attractive to the biologists. First, it is a tool with molecular resolution that enables imaging in physiologic-like environments[2] and secondly it also provides nano-mechanical and chemical information at time scale relevant for bio-molecular interactions[2].

Dynamic AFM images[1] of biological molecules on ambient conditions (liquid) are controlled by nonlinear tip-sample interaction, the cantilever dynamics and the feedback control. In order to extract accurate information about topography and materials properties, these effects have to be taken into account simultaneously. Here we report how to improve the theoretical description of each of these aspects and integrate them into a multi-scale framework that incorporates different levels of computer modeling in order to address the ultimate spacial resolution and force sensitivity of the AFM on biological molecules.

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[2] Ricardo García, Rubén Pérez, Surf. Sci. Rep., *47*, 197 (2002).

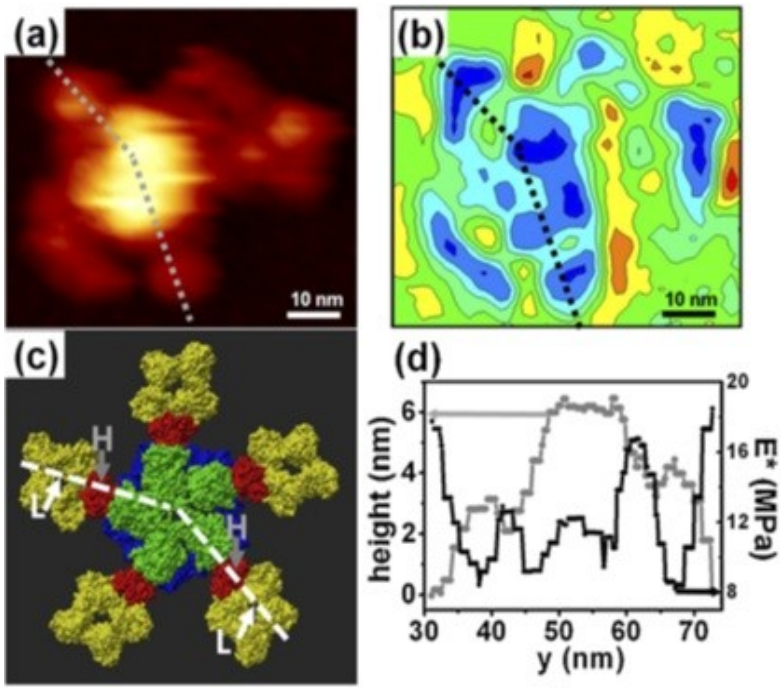

Figure 1. Figure from Ref.[1]. Topography and flexibility map of a single IgM antibody. (a) Bimodal FM AFM image . (b) Flexibility map obtained simultaneously with the topography image. (c) Pentamer structure of the IgM antibody. The locations of the lowest (L) and highest elastic moduli (H) are marked. (d) Topography (grey) and flexibility (black) profiles along the lines marked, respectively, in (a) and (b).

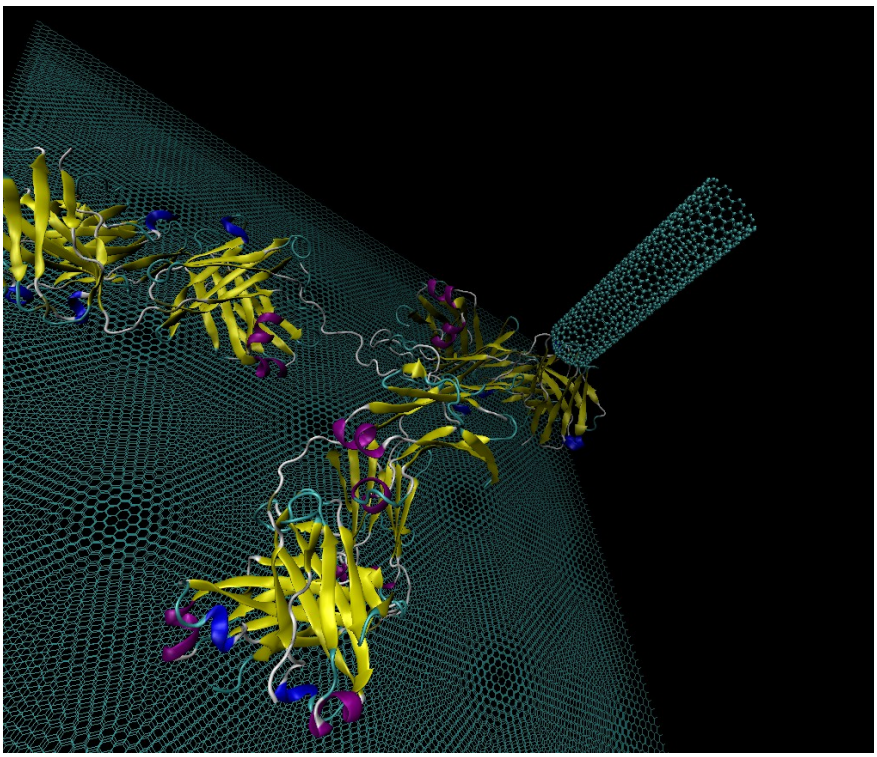

Figure 2. Schematic representation of Human immunoglobulin G over a graphite slab. It is also represented the capped carbon nanotube that will serve as our AFM tip.