



Three-dimensional molecular resolution mapping of soft matter-liquid interfaces 3DNanoMech

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Optical, electron and probe microscopes are enabling tools for discoveries and knowledge generation in nanoscale science and technology. High resolution –nanoscale or molecular-, noninvasive and label-free imaging of three-dimensional soft matter-liquid interfaces has not been achieved. **Force microscopy** (AFM) is considered the second most relevant advance in materials science since 1960. Despite its impressive range of applications, the technique has some key limitations. Force microscopy has not three dimensional depth. What lies above or in the subsurface is not readily characterized.

3DNanoMech proposes to design, build and operate a **high speed** force-based method for the **three-dimensional** characterization of **soft matter-liquid interfaces** (3D AFM). The microscope will combine a detection method based on force perturbations, adaptive algorithms, high speed piezo actuators and quantitative-oriented multifrequency approaches. The development of the microscope cannot be separated from its potential applications. The proposal targets the imaging of the error-free DNA repair and to understand the relationship existing between the nanomechanical properties and the malignancy of cancer cells. Those problems encompass the different spatial –molecular-nano-mesoscopic- and time –milli to seconds- scales of the instrument.

In short, 3DNanoMech aims to image, map and measure with picoNewton, millisecond and angstrom resolution the three-dimensional structure of soft matter-liquid interfaces. The long-term **vision** of 3DNanoMech is to **replace** schemes or computer animations of bimolecular-liquid interfaces by **real time**, molecular resolution maps of properties and processes.