

Resonance Enhanced AFM-IR: On the Way to Single Molecule

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Resonance Enhanced AFM-IR, is a new generation of AFM-IR technique [1] allowing analysis of nanoscale samples by changing the IR source. With this new configuration, the sensitivity and the spatial resolution of the AFM-IR technique is significantly increased.

Imaging of self-assembled monolayers was realized [2] proving the high sensitivity and resolution of this new technique which is achieved by measuring molecular expansion using force detection.

We present the experimental set-up and some of the critical technical sides and then illustrate technological advances with proteins spectra obtained on different biomaterials: first of all *Streptomyces*, a soil bacterium, whose mycelium evolves from basal to aerial state with an autophagy process. The result of such a process is to find ghosts inside the cell culture which are "empty filaments" composed only of cell walls and membranes. The resonance enhanced technique will allow us to detect the proteins by their infrared spectra directly on the ghost filament. Secondly in order to emphasize the sensitivity gain obtained with the new configuration, we will present results obtained on collagen I. The aim is to look at degradation process at the fibrils scale.

References

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- [2] F. Lu, M. Jin, M.A. Belkin, *Nat. Photon.* 8, 307–312 (2014).