Multimodal All-Optic UHV AFM for Chemical Contrast

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**Context** The science community is still waiting for the ideal atomic microscope that could allow clean observation of the specificity of the state of atoms on a surface in a discriminating manner. Dynamic Force Microscopy (DFM) would be the ultimate chemical contrast technique if it was not restricted to frequency shift mappings and could also summarise, in a 2D image, all the physical properties of the atoms on the sample.

**Objectives & Methods** With our new home-made UHV nc-AFM, we developed an innovative scanning method allowing simultaneous acquisition of the topography with the chemical contrast of all the atoms on the surface. The 2D chemical contrast mapping is generated by merging different physical parameter channels, each one corresponding to one component of the final colour [1].

**Results** All the theoretical aspects have been fully demonstrated by Pierre E. Allain [2] and were confirmed experimentally [3]. Important progresses in noise reduction and sensitivity were obtained with the use of the new specific electronic equipments made by Dai Kobaysahi. Good improvements in atomic resolution imaging could also be achieved recently thanks to the useful advices of the former lab member Frank Rose.

“The voyage of discovery is not in seeking new landscapes but in having new eyes”. Marcel Proust

**References**

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![Fig 1. Example of atomic resolution obtained on Si(111).](image1)

![Fig 2. On-the-fly acquisition of the frequency shift (indigo) and complementary interaction measurements on Si(111) using lock-in](image2)