

## A stabilized variable temperature scanning tunneling microscope

*Cornelius Krull, Wolfgang Theis, J. I. Pascual*  
*Instituto Catalá de Nanotecnología(ICN), Dirección, Barcelona, España*  
[cornelius.krull.icn@uab.es](mailto:cornelius.krull.icn@uab.es)

### Abstract

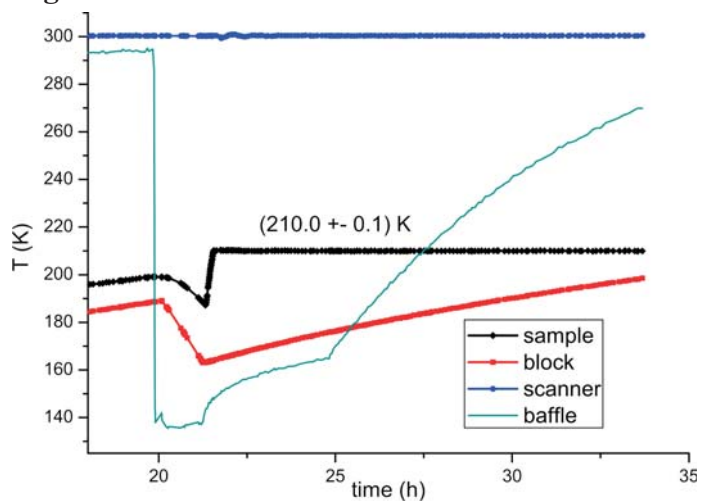
We report on the design of a variable temperature scanning microscope[1] operating in ultra high vacuum. The sample temperature can be varied from 100 K to 300 K by using a massive copper block cooled by liquid nitrogen as a cold reservoir, and a zener diode for counter heating. Through this method the sample temperature to be stabilized for up to 12 hours, while at the same time it can be changed on a minute time scale. By controlling the temperature the drift is reduced to 8 Å, per minute. Atomic resolution on clean silicon surfaces can be achieved in the entire temperature range. The system uses the commercial nano positioning system Attocube for the coarse approach allowing the use of two molecular in-situ evaporators from below.

As an initial study the DNA nucleobases adenine and thymine were investigated on the Ag/Si(111) $\sqrt{3}\times\sqrt{3}$  surface. This surface is known for free diffusion of organic molecules, allowing the formation of ordered condensed phases at low temperatures. These molecules are good candidates for the formation molecular networks dominated by hydrogen bonding, since they are already known to form complex structures like the DNA alpha helix. The formation of their networks was characterized and the molecular structure determined. Adenine grows from dendritic islands to large ordered networks containing enantiomorphous domains. The chirality and periodicity observed confirms previous measurements of the same system [2]. The thymine molecules formed dimer rows with a 5x1 periodicity, similar to those observed on Au(111) [3]. The rigidity of the thymine dimer compared to substrate interactions is identified as the reason.

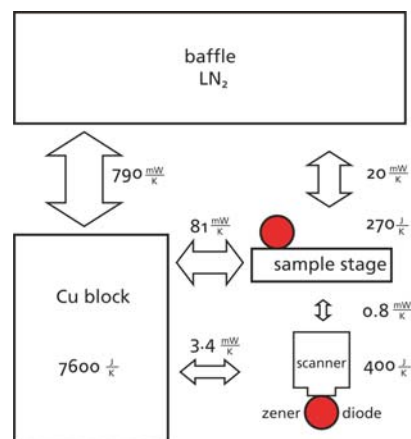
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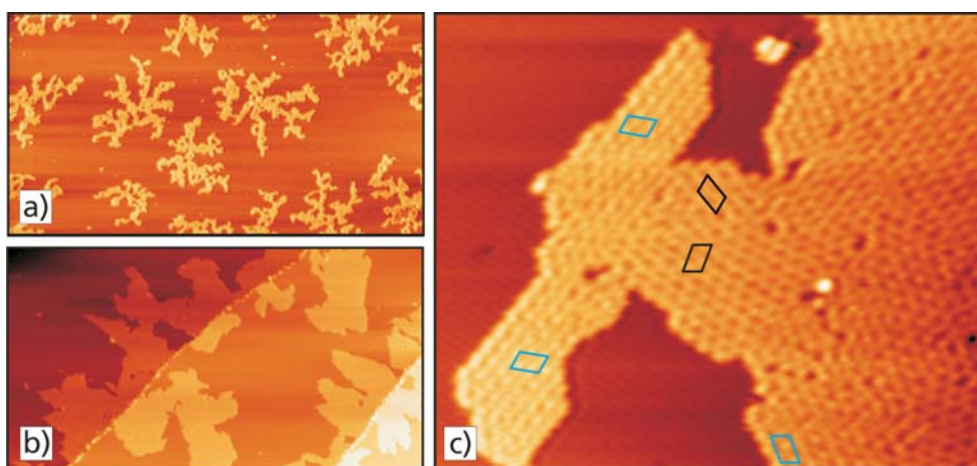
**Figuras:**



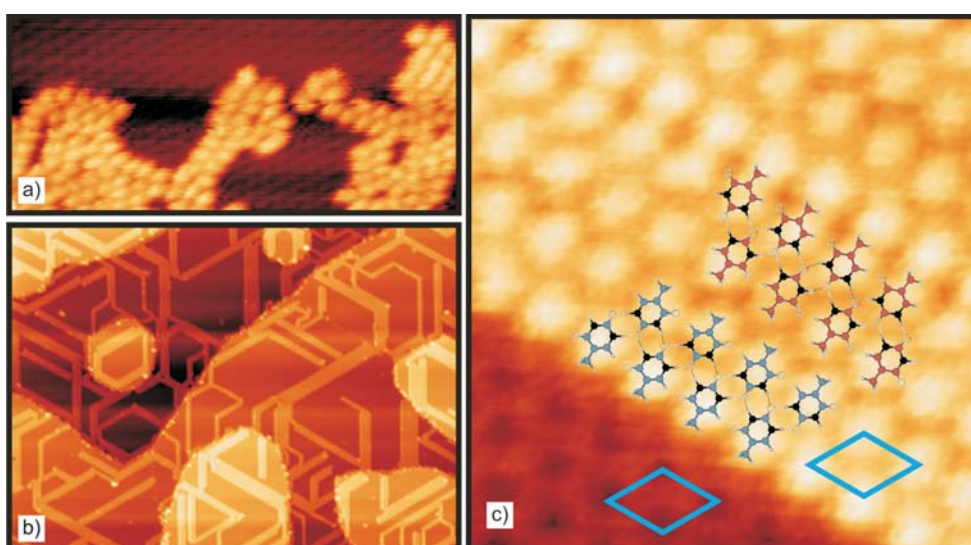
**Fig.1** Sample temperature stabilization for 12 h



**Fig.2** Thermal coupling in the VT-STM (measured)



**Fig.3** Growth of Adenine on Ag/Si(111) a)100 K b)+c) 270K



**Fig.4** Growth of Thymine on Ag/Si(111) a)150 K b)+c) 300 K