The Features and Benefits of the Low Temp PanScan: An Interview with Adam Kollin

Interview conducted by Alexander Chilton

Adam Kollin, President of RHK Technology, talks to AZoNano.com about the features and benefits of the Low Temp PanScan.

AC: Could you please provide our readers with an introduction to RHK Technology and the industries that you work within?

AK: Yes, to briefly introduce RHK, we design and manufacture a full line of world-class Ultra High Vacuum Scanning Probe Microscope (UHV SPM) instruments and Control Systems. Our main goal is to enable scientists to continually advance surface science and nanotechnology research and development of new materials.

RHK optimizes its systems to meet the specific and demanding requirements of nanotechnology researchers seeking fundamental discoveries that can lead to solutions for daily life.

Our UHV SPM instruments and Controllers are carefully engineered to provide atomic-scale imaging, interaction, and analysis, and to perform atomic manipulation and nanofabrication. RHK products are installed at top University and National Research Laboratories around the world.

One of our unique capabilities is to combine our design expertise and knowledge with ideas and scientific projects from our customers, leading to commercialized instruments that push beyond the bounds of routine measurements.

AC: RHK Technology was founded in 1981 to develop scientific instruments. How has the company grown and evolved over the years?

AK: Our first instrument was a HREELS system quickly followed by a digital temperature controller for TPD studies. This passion to develop state-of-the-art acquisition and control electronics was quickly focused on the curious new technique called Scanning Tunnelling Microscopy (STM) and we released the first commercial STM control system in 1987.

Growing out of our strength in control systems we began to design and manufacture complete STM systems and launched the Beetle UHV STM system in 1994, a design renowned for its very low thermal drift.

Through the mid-2000s RHK's SPM 1000 control system was the world standard for highly flexible, low-noise control systems. Over 1000 were sold to most of the world's top research labs.

In 2004 we developed the world's first commercially available cryogenic multi-probe SPM system with 4 independent scanning probes and integrated SEM/SAM. Our focus returned to control electronics and making the best fully digital universal SPM controller, the R9. The R9 digitally integrates numerous lock-in amplifiers, PLLs, feedback loops, digital oscillators.

Researchers can quickly configure the system to implement any type of measurement. The R9's noise floor of a few nv/rt Hz and a bandwidth of 20 MHz enable previously unobtainable measurements.

Over the last year RHK has directed its expertise at two key areas : Nano optics, delivering a TERS ready SPM and a low temp, UHV compatible sSNOM system and the PanScan Freedom, a cryogen-free low temperature SPM.

AC: RHK Technology recently launched the Low Temp PanScan. Could you provide a brief description of the microscope

and its main capabilities?

AK: Well the PanScan is actually a family of low temperature scanning probe microscopes. The recently launched PanScan Freedom brings something entirely new to the field of low temp SPM; the ability to routinely study samples at temperatures near 15 Kelvin without using any liquid cryogens, more specifically liquid helium.

Our proprietary interface and noise isolation system allow us to use a closed cycle cryostat to provide probe and sample cooling yielding the benefits of:

- Liquid He-free
- Cryogen cost-free
- Atomic resolution 15-400 K
- XY drift as low as 0.2Å/hour
- Z drift as low as 0.2Å/day
- Superb stability for spectroscopy measurements
- Noise level < 1pm

AC: What are the main benefits and advantages of using the Low Temp PanScan?

AK: The most obvious advantage is eliminating the need for liquid cryogens. Because of the current prices for liquid helium, a common question is *"how many experiments can I afford to do?"*

For typical liquid helium cooling the costs can be between $25-$40 per hour to run an experiment (with a minimum of 6 hours to initially cool the sample), however with our closed cycle system the typical costs are about $1 per hour.

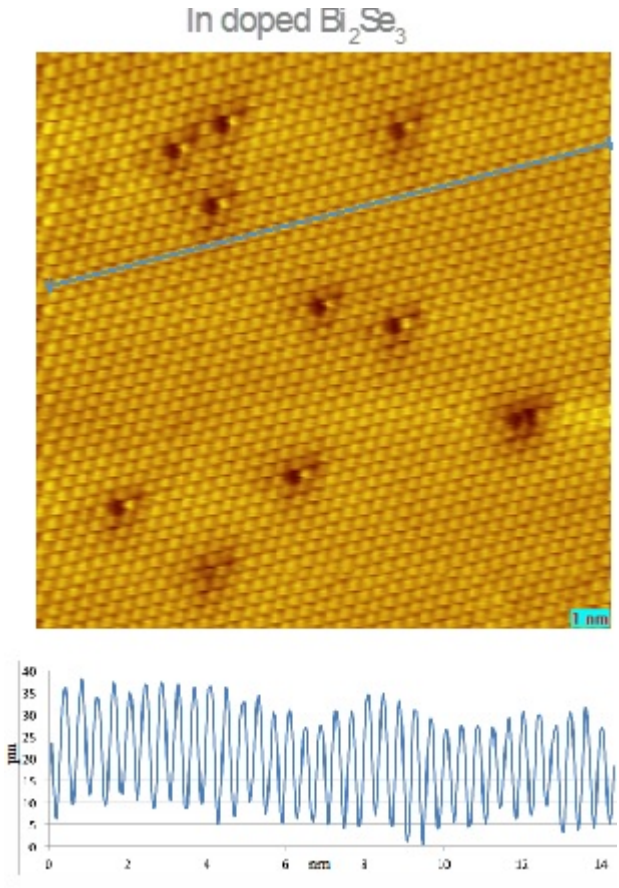
With the simplicity of operation and superb stability, the PanScan Freedom is generating strong interest from researchers who previously had never entertained the idea of low temp UHV SPM because of the complexity and cost.

AC: What are the primary applications of the Low Temp PanScan?

AK: SPM has many applications in characterizing the topography and nano-scale electrical properties of emerging new materials, however, most of this research begins with fundamental surface characterization.

AC: How is the Low Temp PanScan unique?

AK: Much of the uniqueness of the PanScan Freedom has already been discussed, but to summarize it is really the ability to collect SPM data at typical liquid helium cryostat temperatures without using any liquid cryogens.



AC: Are there any recent case studies involving the Low Temp PanScan that you are particularly proud of?

AK: Our collaborator and early adopter, Professor George Nazin at the University of Oregon has recently published several papers showing interesting results on single walled carbon nanotubes.

AC: Where do you currently supply to? Are there plans to expand operations in the near future?

AK: RHK supplies instruments and control electronics world-wide through a combination of direct sales and distributors. Our primary customers are academic research laboratories and national laboratories.

AC: How do you see the atomic and molecular microscopy industry progressing over the next decade?

AK: There is no simple answer to that question, because many of the modes and techniques used today were not obvious progression of existing technology.

However, speaking more generally scientists are interested in topography, electromagnetic properties, mechanical properties, and chemical (spectroscopic) properties.

Therefore, development and refinement of many of the hybrid techniques, like TERS, sSNOM, scanning impedance, and modulus mapping are logical areas to focus.

AC: How will RHK Technology be a part of this change?

AK: The key ingredient in developing new SPM systems and new modes of operation is having a high performance, very flexible and configurable, state of the art controller, which we have in the R9.

This is the foundation from where we can develop exciting new instruments like the PanScan Freedom as well as cutting edge Nano optics based SPMs.

About Adam Kollin

Adam Kollin founded RHK Technology in 1981 and has served as President since that time.

RHK Technology is now a world leader of high performance SPM microscopes and control systems and is the only American manufacturer of Ultra High Vacuum (UHV) STMs and AFMs.

The company has grown to 50 employees, almost half of which are physicists, electrical, mechanical and software engineers.

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Primary Activity

Scanning Probe Microscopes

Company Background

RHK delivers compelling value and proven quality to broaden the frontiers of atomic scale research. We stand ready to meet your specifications and exceed your expectations.

RHK's surface science systems integrate only the best analytical and preparation instruments from top industry suppliers. To further advance products and performance, we consult top scientists in our Technical Advisory Board as well as customers confronting new research challenges.

Everyday, in university and government labs around the globe, RHK research platforms lead to new discoveries in nanotechnology. Founded in 1981, RHK Technology brings over 25 years of experience to the design and manufacture of advanced UHV SPM instruments. Our installed base continues to grow and now includes over 175 systems and 1000 controllers.