



A CASE STUDY

RHK CUSTOMER SUCCESS

RHK PanScan SPM integrated with Cryo Industries 4K Liquid Helium Cryostat



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OVERVIEW

If you've chosen your preferred supplier of a 4 K LHe bath cryostat for a lab-built LT STM system, now what's the best choice of a scan head to mate with it for your research goals? And how can you get support for key components from different suppliers, when overall performance and research success depend on everything working just right together?

This was the situation confronting Dr. Aynajian when he joined the Physics Department at Binghamton University. His intended nano-research at SUNY-Binghamton required variable temperature starting as low as 4 K. A LHe-bath cryostat was a necessity. To get the whole package he needed within his budget, a thoughtful approach of mix-and-match plus do-it-yourself was required for the bath cryostat, scan head, and control electronics and software.

Dr. Aynajian chose Cryo-Industries of America to provide his 4 K cryostat. His decision was based on Cryo-Industries crucial combination of key features: suitability of overall design for a university lab-based self-builder/researcher; adequate 4 K hold-time; adaptability of mounts to accept a 3rd party scan head; and US-based production, service and support.

Discussing his choices, Dr. Aynajian commented,

“ *With a limited start-up budget, going for a million-dollar machine was not an option.* ”

Now he needed to make a final decision on the scan head and control system. The RHK PanScan scan head had attracted Dr. Aynajian's attention. As he explained,

“ *...it was compact, isolated from the environment by a spring/magnetic damping system, and - most importantly - customizable to enable the lateral movement of the sample as well as the possibility of introducing multiple samples simultaneously.* ”

There were additional factors, too. He added,

“ *RHK not only provided build-your-own options, but also highly experienced engineers who helped in solving the technical details to ensure a successful integration and operation of the system.* ”

Likewise, he knew the optimal choice for the best scan head Control System would be RHK's R9, due to its perfect compatibility with the RHK PanScan as well its broad flexibility and readily accessible depth of capabilities for the challenging range of experiments he planned. This matched pair of LT scan head and electronic controls, both built, supported, and serviced by a single US company, provided him the proof of performance and track record to be confident in his choices. RHK agreed to build custom

mounting to mate the scanner and cryostat, and to advise and assist with wiring.

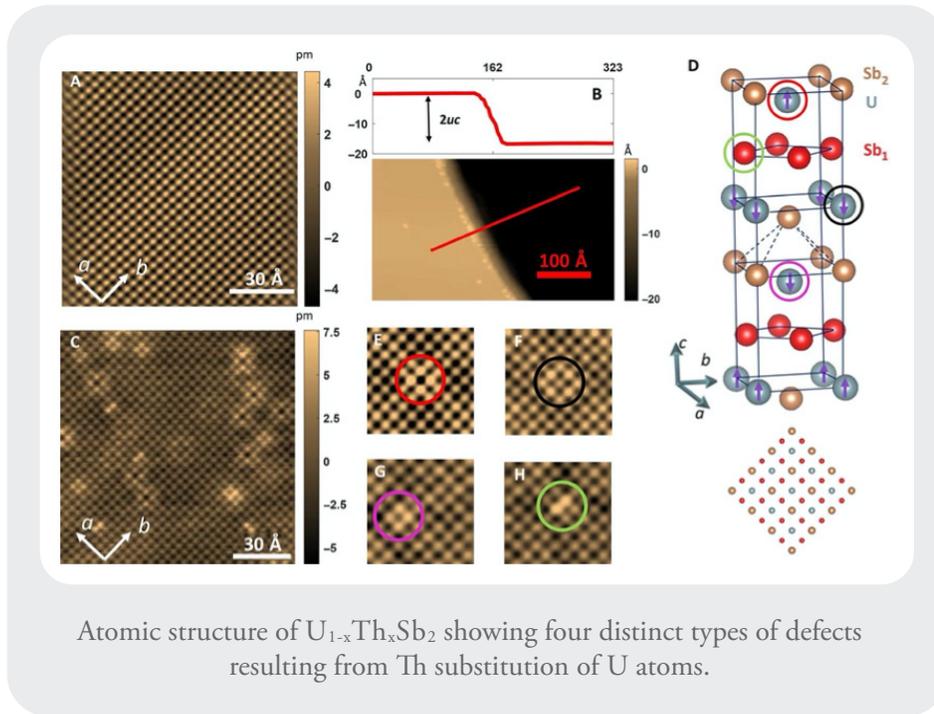
Now he could concentrate fully on his PanScan 4 K LT STM research. Dr. Aynajian is producing many published results. He is happy with his choices and the crucial support and service he received. A few of his results and images are displayed below.

SYSTEM

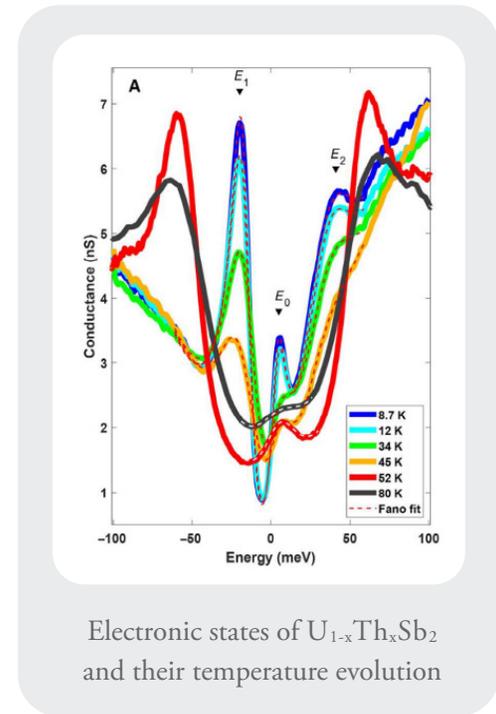
RHK's PanScan STM head and vibration isolation system (shown below), installed using an RHK-designed and built custom mount into his Cryo-Industries of America LHe 4 K bath cryostat, and controlled by RHK's R9 system. Dr. Aynajian's 4 K system is operating great and continues to produce published results.



RESULTS

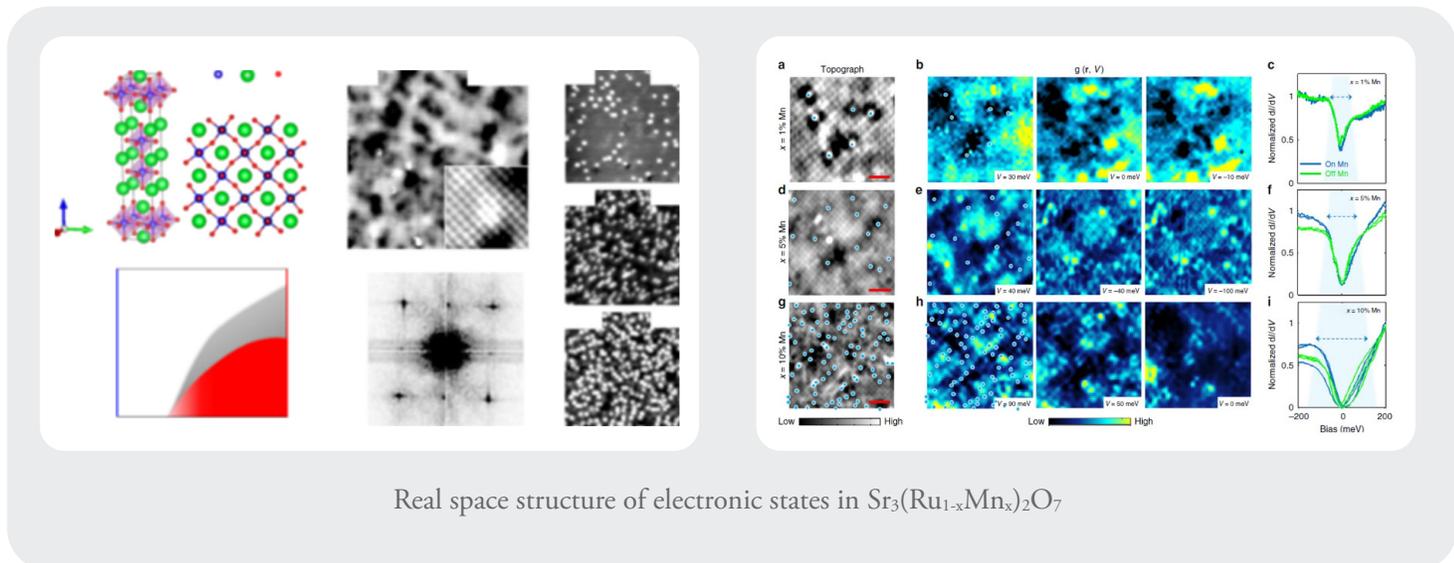


Atomic structure of $U_{1-x}Th_xSb_2$ showing four distinct types of defects resulting from Th substitution of U atoms.



Electronic states of $U_{1-x}Th_xSb_2$ and their temperature evolution

Orbital-selective Kondo lattice and enigmatic f electrons emerging from inside the antiferromagnetic phase of a heavy fermion *Science Advances* | Research Article – Giannakis *et al.*, *Sci. Adv.* 2019;5:eaaw9061 18 October 2019



Real space structure of electronic states in $Sr_3(Ru_{1-x}Mn_x)_2O_7$

Emergent charge order near the doping-induced Mott-insulating quantum phase transition in $Sr_3Ru_2O_7$ *Nature – Communications Physics* | (2019)2:36