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**Cryogen free scanning probe microscope: the solution for atomic scale surface science below 10 Kelvin without liquid helium** BYOUNG CHOI, MIGUEL VENEGAS, RHK Technology Inc., RHK TEAM — We present a cryogen free low temperature scanning probe microscope (LT-SPM) working at 9K on both tip and sample. The performance of the microscope was validated in various conditions such as noisy environment and modulated temperature as well as the long time elapsed measurements. Building on the stability and consistency of the closed cycle refrigerator, time extended measurements are available with this state-of-the-art LT-SPM. Studies can now be performed without interrupting the critical moment of the tip on the surface while refilling the conventional liquid cryogen tank. We will present the time evolution of the dopant induced topographic and spectroscopic properties of some topological insulators such as Bi2Se3 and Bi2Te3. The compact and rigid design of the microscope also allows this instrument to work as a practical variable temperature microscope without the hassle of liquid cryogen consumption. We will present temperature dependent STM/STS results on a TiSe2 surface at the temperature between 10K and 350K. Finally, we will discuss how the cryogen free LT-SPM will make the study of the atomic scale phenomenon at low temperature both economical and easy, opening promising new capabilities to surface scientists and researchers in nanotechnology.

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