Contribution ID: **200** Type: **Contributed Oral**

C4Or1A-04: Ice lithography integrated with a micromachined Joule-Thomson cooler

Thursday 13 July 2023 10:45 (15 minutes)

This study introduces a novel ice lithography system integrated with a low-vibration micromachined Joule-Thomson cooler. Ice lithography is an eco-friendly method for high-resolution nanofabrication on delicate substrates and requires to operate below 130 K in the vacuum of a microscope chamber. Previously, liquid nitrogen rather than cryocoolers was used to cool the system due to its low vibration, but it is both bulky and costly. To overcome these challenges, this study employs a low-vibration micromachined cooler in a scanning electron microscope (SEM) for ice lithography. The design and methodology of the system are described in detail. The results show that the substrate can reach a temperature of 105 K within 30 minutes with a measured mechanical vibration of less than 10 nm, enabling high-resolution nanofabrication. As proof of concept, the system successfully fabricates nanoscale patterns on a silicon chip. This low-vibration cooling system has great potential for use in cryo-EMs in the future.

Author: QI, Limin (Westlake University)

Co-authors: Mr ZHAO, Ding (Westlake University); LIU, Dongli (Westlake Instruments (Hangzhou) Technology Co., Ltd); PEI, Haiyue (Westlake University); Mr QIU, Min (Westlake University); Mr ZHENG, Rui (Westlake University)

Presenter: QI, Limin (Westlake University)

Session Classification: C4Or1A: Thermophysics V: Solid Properties

Track Classification: ICMC Submission Categories: ICMC-19 –Applications: Microelectronics, Photonics, Sensors, Detectors, Computation (Quantum, neuromorphic, others)