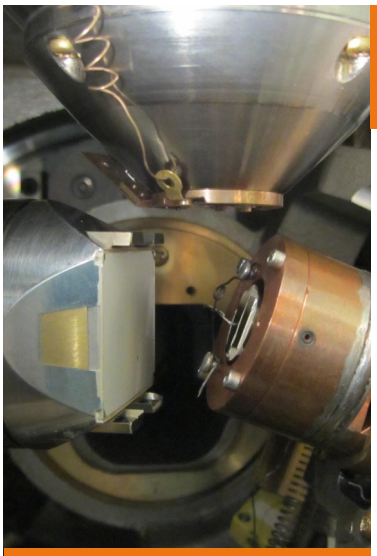
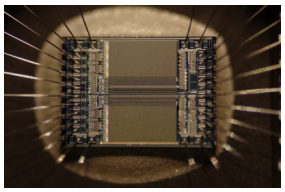
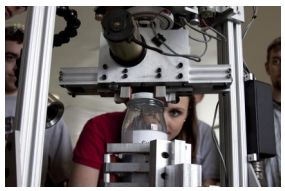


rpitechnology.com

Rensselaer | OFFICE OF TECHNOLOGY COMMERCIALIZATION



Seeking commercialization partner for

Temperature Mapping by Electron Probe in Scanning Electron Microscope

Rensselaer researchers have developed a scanning electron microscopy based temperature mapping technique which employs a temperature sensitive electron signal for nano-scale resolution, non-contact measurement. It provides enhanced capabilities for investigating heat generation and transfer at the nanoscale to address long-standing issues related to power consumption, heat dissipation and energy conversion efficiency in many current and future generation nano-engineered systems.

▶ Applications

- Enable EBSD-equipped SEMs with nano-scale non-contact temperature mapping capabilities
- Nano-scale heat generation and transfer studies in microelectronic, optoelectronic and micromechanical systems

▶ Advantages

- Very sensitive: nano-scale resolution temperature mapping
- Non-contact far-field in-situ method
- Collect thermal, topographical, and other SEM images simultaneously from the same field of view
- Integrable: hardware setup of this technique is identical to a typical SEM equipped with an EBSD detector

Detection of nano-scale temperature distribution is important for studies of heat generation and transfer in a wide range of nano-engineering systems; however, no current temperature mapping techniques (mainly contact probe techniques, optical techniques, and thin coating methods) adequately combine both nano-scale resolution and far-field (~ cm away from the sample) non-contact mapping capabilities, which are required. Rensselaer researchers developed a novel SEM-based technique capable of nano-scale resolution temperature mapping without the temperature perturbations from which contact or near-field temperature mapping techniques suffer. These capabilities address issues in nano-scale heat generation and transfer research.

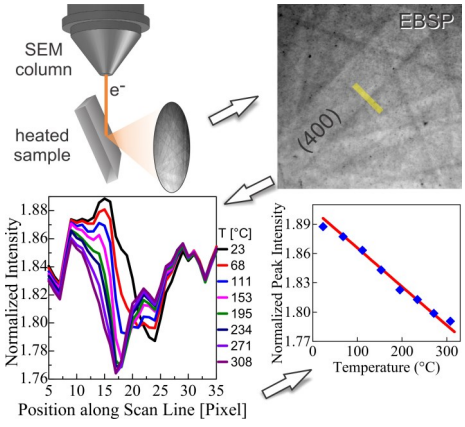


Figure: Summary of nano-scale temperature measurement by EBSD analysis. Top left – experimental geometry. Top right – part of typical EBSD pattern from Si(001). Bottom left – intensity scans across (400) Si Kikuchi line at different temperatures. Bottom right – calibration of normalized peak intensity *vs.* temperature.

Since the hardware setup of the technique is compatible with existing SEMs, implementation only requires relatively straight-forward SEM software modification to extract the temperature sensitive signal with the hardware largely unchanged, rendering commercialization inexpensive to existing EBSD-enabled SEM systems.

PUBLICATIONS

X. Wu and R. Hull, "A novel nano-scale non-contact temperature measurement technique for crystalline materials," *Nanotechnology*, 23, 465707 (2012).

X. Wu and R. Hull, "The material dependence of temperature measurement resolution in thermal scanning electron microscopy," *Appl. Phys. Lett.,* 102, 113107 (2013)

STATUS Contact for more information

INVENTORS Xiaowei Wu, Robert Hull

OTC CASE 1506

MIND TO MARKETPLACE

For More Information: otc@rpi.edu • (518) 276-6023 • 110 8th Street, J Bldg., Troy, New York 12180