

# Array Atomic Force Microscopy Enabling Simultaneous Multi-point and Multi-modal Nanoscale Analyses

Tech ID: 30283 / UC Case 2018-143-0

## BACKGROUND

Nanoscale multipoint structure-function analysis is essential for deciphering the complexity of multiscale physical and biological systems. Atomic force microscopy (AFM) allows nanoscale structure-function imaging in various operating environments and can be integrated seamlessly with disparate probe-based sensing and manipulation technologies. However, conventional AFMs only permit sequential single-point analysis. Widespread adoption of array AFMs for simultaneous multi-point study is still challenging due to the intrinsic limitations of existing technological approaches.

## TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have developed methods, devices and applications that pertain to an array AFM platform based on dispersive optics and capable of simultaneously monitoring multiple probe-sample interactions. A single supercontinuum laser beam is utilized to spatially and spectrally map multiple cantilevers, so the beam deflection from individual cantilevers can be isolated and recorded by distinct wavelength selection. This new design provides a remarkably simplified yet effective solution to overcome optical crosstalk, while maintaining sub-nm sensitivity and compatibility with probe-based sensors. The invention provides new opportunities for studying emergent properties of atomic-scale mechanical and physicochemical interactions in a wide range of physical and biological systems.

## APPLICATIONS

Instrumentation/research tool for multiparametric analysis of dynamic systems in wide-ranging fields

## ADVANTAGES

Versatility and robustness of approach; parallel multiparametric imaging at multiscale levels, e.g.: surface morphology to hydrophobicity and electric potential mapping in both air and liquid; mechanical wave propagation in polymeric films, dynamics of living cells

## STATE OF DEVELOPMENT

Prototype stage

## INTELLECTUAL PROPERTY INFO

This invention has a provisional patent application

## RELATED MATERIALS

- ▶ Qingqing Yang, Qian Ma, Kate M. Herum, Chonghe Wang, Nirav Patel, Joon Lee, Shanshan Wang, Tony M. Yen, Jun Wang, Hanmei Tang, Yu-Hwa Lo, Brian P. Head, Farooq Azam, Sheng Xu, Gert Cauwenberghs, Andrew D. McCulloch, Scott John, Zhaowei Liu, and Ratnesh Lal. Array atomic force microscopy for real-time multiparametric analysis. PNAS March 26, 2019 116 (13) 5872-5877; published ahead of print March 8, 2019 doi.org/10.1073/pnas.1813518116 - 03/26/2019

## PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	WO 2020/076877	04/16/2020	2018-143

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## OTHER INFORMATION

### KEYWORDS

AFM, atomic force microscopy, dispersive optics, multiparametric analysis, nanobiosensing, nanoimaging

### CATEGORIZED AS

- ▶ **Optics and Photonics**
  - ▶ All Optics and Photonics
- ▶ **Imaging**
  - ▶ Molecular
- ▶ **Nanotechnology**
  - ▶ Tools and Devices
- ▶ **Research Tools**
  - ▶ Other
- ▶ **Sensors & Instrumentation**
  - ▶ Biosensors
  - ▶ Physical Measurement
  - ▶ Scientific/Research

### RELATED CASES

2018-143-0

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