Mechanisms and Devices Enabling Arbitrarily Shaped, Deep-Subwavelength, Acoustic Patterning

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SUMMARY

UCLA researchers in the Department of Mechanical and Aerospace Engineering have developed a Compliant Membrane Acoustic Patterning (CAMP) technology capable of patterning cells in an arbitrary pattern at a high resolution over a large area.

BACKGROUND

Acoustic force has been investigated as a noninvasive, label-free, and biocompatible tool to physically manipulate cells and other biological entities. To date, however, acoustic approaches to produce high resolution, arbitrarily shaped wells across a large area has not been achieved, limiting its applications and contributions to single cell manipulation.

INNOVATION

UCLA researchers led by Dr. Pei-Yu Chiou has developed a device and method to create deep sub-wavelength resolution, arbitrarily shaped acoustic potential wells using widely available piezoelectric ceramic (PZTs) and Polydimethylsiloxane (PDMS) materials. The device has been successfully prototyped and has achieved a line resolution of 50 μm (1/10 of the wavelength) and patterning area of 3 × 3 mm^2. The team has also demonstrated the ability to form a wide range of arbitrary shapes using both microparticles and cells. This technology can greatly improve the standard of single cell manipulation and can benefit the investigation and manufacture of various biomedical products such as engineered tissues and personalized therapeutics.

APPLICATIONS

- Manufacturing complex biologic products
- Cell manipulation
- Tissue engineering
- Personalized therapeutics

ADVANTAGES

- High resolution (1/10 of the wavelength)
- Large patterning area (3 × 3 mm^2 demonstrated)
- Customizable patterning shapes

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,280,372	04/22/2025	2019-852

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

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INVENTORS

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OTHER INFORMATION

KEYWORDS

acoustic patterning, cell soring, single cell, microfluidic, PDMS, tissue engineering, polydimethylsiloxane, piezoelectric ceramic, PZTs, arbitrarily shaped

CATEGORIZED AS

- **Biotechnology**
  - Other
- **Engineering**
  - Engineering
- **Imaging**
  - Medical
- **Medical**
  - Devices
  - Research Tools
- **Research Tools**
  - Cell Lines
- **Sensors & Instrumentation**
  - Biosensors
  - Medical
  - Scientific/Research

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- A Device For Continuous Focusing And Rotation Of Biological Cells And Its Application For High Throughput Electrorotation Flow Cytometer

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