

## Wafer-Scale Protein Patterning Of Hydrogel Devices

Tech ID: 32575 / UC Case 2022-762-0

### BACKGROUND

Precise tuning of cellular microenvironments is key for cellular research; especially in therapeutics. Such tuning can be achieved with protein patterning, but it requires significant cleanroom resources and photolithography expertise.

This presents an obstacle for researchers in various therapeutic areas, including cardiac medicine, where the study of cardiomyocytes (CMs) is critical. Ideally, researchers could isolate CMs from patients, but the cells do not regenerate and are difficult to culture in vitro. Animal models provide a substitute, but their relevance to human biologics is limited. Human induced pluripotent stem cell-derived CMs (hiPSC-CMs) are an unlimited cell source and a promising in vitro model for cardiac research, but they require protein patterning to select appropriate cells. Improving the accessibility of protein patterning would mark a substantial step forward in cardiac disease research among other fields requiring precisely tuned cellular microenvironments.

### DESCRIPTION

Researchers at the University of California, Santa Barbara, have addressed the challenge of traditional cell patterning with a photolithography-based approach for scaled-up fabrication of glass chips that can be used to either make hydrogel devices or protein patterns directly on the chips. This approach generates a high quantity of pattern templates that can be used more than six months after fabrication, allowing researchers to source these templates without the requirement of cleanroom infrastructure and expertise in their own labs. The novel process also increases the precision and compatibility polyacrylamide hydrogels. Using this technology, single cell hiPSC-CMs have demonstrably adhered, spread to a high aspect ratio, and actively contracted to the hydrogels.

### ADVANTAGES

- ▶ Reproducible and high-accuracy protein pattern
- ▶ Templates are shelf stable for over six months
- ▶ Reduced cost of shelf-stable photoresist patterned coverslip
- ▶ Templates/patterns can be designed for different cell shapes, single cell or multiple cells, ECM protein or cell-cell protein types
- ▶ Optimization for polyacrylamide hydrogel precision and compatibility
- ▶ Uses standard lab equipment to generate protein patterns on glass or protein-patterned hydrogel

### APPLICATIONS

### CONTACT

Donna M. Cyr  
[cyr@tia.ucsb.edu](mailto:cyr@tia.ucsb.edu)  
tel: .

### INVENTORS

- ▶ Castillo, Erica
- ▶ Kim, Anna
- ▶ Lane, Kerry
- ▶ Pruitt, Beth
- ▶ Villapando Torres, Gabriela

### OTHER INFORMATION

#### KEYWORDS

protein patterning, hydrogel, photolithography, cell, microenvironment, cardiomyocytes, hiPSC-CMs, cardiac research, polyacrylamide

#### CATEGORIZED AS

- ▶ **Medical**
  - ▶ Disease: Cardiovascular and Circulatory System
  - ▶ Stem Cell
  - ▶ Therapeutics
- ▶ **Research Tools**
  - ▶ Bioinformatics
  - ▶ Other
  - ▶ Protein Synthesis

#### RELATED CASES

2022-762-0

- ▶ Therapeutics
- ▶ Cardiac research

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20230158149	05/25/2023	2022-762

## RELATED MATERIALS

- ▶ [Wafer-Scale Protein Patterning of Hydrogel Devices Patent - 05/25/2023](#)
- ▶ [Wafer-Scale Patterning of Protein Templates for Hydrogel Fabrication - 11/12/2021](#)

University of California, Santa Barbara  
Office of Technology & Industry Alliances  
342 Lagoon Road, Santa Barbara, CA 93106-2055 |  
[www.tia.ucsb.edu](http://www.tia.ucsb.edu)  
Tel: 805-893-2073 | Fax: 805.893.5236 | [padilla@tia.ucsb.edu](mailto:padilla@tia.ucsb.edu)



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