

# Generic Method for Controlled Assembly of Molecules

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## ABSTRACT

Researchers at the University of California, Davis, in collaboration with researchers at IBM, have developed a widely applicable method to assemble molecules regardless of their intrinsic self-assembly properties.

## FULL DESCRIPTION

Molecular assembly from the molecular level through to the mesoscale relies on self-assembly (at smaller scale), crystallization (meso), and manufacturing (macroscale). However, conventional self-assembly is limited to molecular systems that form ordered assemblies driven by thermodynamics. A method for controlled molecular assembly that can be applied to a much larger variety of molecules has benefits for material science, tissue engineering, and nanoscience.

Researchers have developed a widely applicable method to assemble molecules regardless of their intrinsic self-assembly properties. This method controls solute molecular assembly by solvent evaporation of small droplets (typically sub-femtoliter in volume). By controlling initial solution and solvent evaporation conditions — such as the concentration of the solute and the humidity of the environment - this method can control the overall geometry of the resulting structures. Possible structures include disks, mounds, and irregular geometries. Moreover, this method can control intermolecular packing, such as close-packed, interpenetrating, and randomly scattered. Proof-of-concept results have been achieved where sub-femtoliter aqueous droplets containing chosen molecules such as star polymers were deposited on intentionally designed surfaces to yield custom structures. The ability to tailor nanostructures using this technology has applications ranging from materials science to medicine and 3D printing.

## APPLICATIONS

- ▶ Control of molecular assembly across various scales and into various shapes
- ▶ Customizing composition of entities for applications in material science, tissue engineering, and general nanoscience
- ▶ Control of molecular assembly to achieve 3D nanoprinting

## FEATURES/BENEFITS

- ▶ Can be used for virtually any type of molecular system, regardless of intrinsic self-assembly behavior
- ▶ Can control structure internal density from inter-molecular packing
- ▶ Can create irregular geometric structures
- ▶ Precise spatial control – precision in placement - at nanometer scale

## PATENT STATUS

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## OTHER INFORMATION

### KEYWORDS

self-assembly,  
 evaporation-driven  
 assembly, 3D  
 nanoprinting, 3D  
 nanostructures, ultra-  
 small droplets

### CATEGORIZED AS

- ▶ **Biotechnology**
- ▶ Other
- ▶ **Materials & Chemicals**
- ▶ Nanomaterials
- ▶ **Nanotechnology**
- ▶ NanoBio

### RELATED CASES

2019-300-0

Patent Pending

## **ADDITIONAL TECHNOLOGIES BY THESE INVENTORS**

- ▶ [Atomic Force Microscopy-based Platform for Investigating Single Cell Mechanics](#)
- ▶ [Organic Crystallinecomposites as New Cryogenic Energy Materials](#)
- ▶ [A New Methodology for 3D Nanoprinting](#)

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