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Modular 3D Printed Devices for Sample Delivery

-Background

Microfluidic devices are commonly used in serial crystallography applications. In most serial crystallography experiments, the sample molecules are formed into droplets through electrical stimulation, then injected into a focused beam of electrons or X-rays so their structure can be analyzed. The various components of the experiment including the droplet generator, droplet detector and nozzle are critical to the accuracy of the experiment. These components have traditionally been challenging to design and fit together due to the small scale at which these experiments are performed, which results in precious sample being wasted.

Invention Description

Researchers at Arizona State University have developed novel modular 3D-printed injection elements for use in serial crystallography experiments. These elements are assembled in a key and lock principle, similar to Lego toy blocks. The elements have multiple functionalities including microfluidic mixers, passive droplet generators, electrically stimulated droplet generators, and nozzles jetting sample. This invention miniaturizes the overall experiment to a few millimeters in size and does not require any connecting capillaries. This invention also fits all elements together through a Lego-like principle, which are then assembled directly together.

Potential Applications

- Serial crystallography experiments

Benefits & Advantages

- Higher resolution than previous 3D printed devices
- Synchronized droplet injection which reduces precious sample waste
- Easier installation of devices at the laser instrument with a smaller footprint
- Closer location of droplet generator to injection nozzle (creates more reproducibility and stability in the droplet generation frequency and triggering)

Inventor Bio: Alexandra Ros | ASU Search