Chemspeed Automated Chemistry Platform

Chemspeed
Tool Type: Robotic Polymer Synthesis Platform
Manufacturer: Chemspeed Technologies
Location: Elings Hall 2411

Principal Scientist
Morgan Bates
morganbates@ucsb.edu

About

The BioPACIFIC MIP automated chemistry platform combines robotics with multiple parallel reactors for polymerization or reaction screening, formulation testing, and material library construction. This workstation is enclosed within an acrylic hood that mimics a glove-box with front-facing neoprene gloves and side-mounted antechamber under a continuous purge of house nitrogen. Robotic tools mount to a motorized arm known as the axis and move in a linear x, y and subsequent z pattern among the various vial racks and reactors to perform a series of unique tasks. These tasks include screw-capping, the transfer of viscous (GDU-V) and non-viscous liquids (4-needlehead, 4-NH), the dispense of solids (GDU-P(fd)), and the transport of vials, well-plates, and vial racks (also referred to as microtiter plates or MTPs).

Modular Toolheads
Depiction of the main robotic tools on the platform. Additional tools not shown include grippers for transporting vials, vial racks, and well-plates and for opening/closing the iSynth reactor drawers.

Multiple reactor systems are available on the platform: (i) the iSynth, (ii) the glass reactor array, and (iii) the MTP pressure block. The iSynth reactor facilitates thermal reactions in 48 × 8 mL disposable glass vials or photochemical reactions under 365 nm illumination in a 16 × 8 mL disposable format. Once reagents are loaded into the vials, any available MTPs (vial racks) can be transferred to the MTP pressure block reactor, allowing reactions to proceed under high pressure (< 100 bar). The glass reactor array comprises a double-jacketed set of 16-, 8-, or 4-glass reactors, with capacities of 13-, 27-, or 100 mL, respectively, for larger-scale transformations. Agitation across all reactor systems is achieved through shaking.

Reactions can also be set up in disposable glass vials (available in 33 × 20 mL and 72 × 8 mL arrays), well plates, or (96 × 1 mL) shell vials, placed on the heat-cool-shake rack for temperature control and mixing. Additionally, photochemical reactions can be initiated using the LED plate from analytical sciences, which offers 365, 405, and 445 nm light, with other wavelengths available upon request.

For workflow flexibility, the system supports various post-reaction processes, including filtration, precipitation, solution transfer, and aliquot sampling from reaction mixtures. Sample preparation for subsequent HPLC, NMR, MALDI, or SEC analysis can also be integrated.

To begin collaborating with a project scientist on your experiment, please provide a general protocol

for the reaction. This protocol should specify:

- Order of reagent addition
- Physical state of each reagent (liquid, solid, viscous liquid)
- Target temperature, heating duration, or illumination time (if applicable)

Reactions are performed on the automated platform deck, where wells are numbered (e.g., 1-96). Reagent volumes (in mL) or masses (in grams) for each well should be provided in a .txt file, with each file named after the corresponding reagent. Each row in the file should correspond to the amount of reagent to be added to the specific well. If no reagent is to be added to a particular well, please enter “0”. All files should contain the same number of entries, matching the total number of reactions performed.

Detailed Specifications