About The Laboratories

BioPACIFIC MIP operates a one-of-a-kind user facility dedicated to creating a nexus between synthetic biology and materials to revolutionize high-performance polymers. The laboratories are jointly located at the California NanoSystems Institute (CNSI) at UCLA and UCSB.

The BioPACIFIC MIP **Synthetic Chemistry Facility** (UCSB) features a suite of unique instruments in a one-of-a-kind facility that forms the nexus between discovery, materials-by-design, and biomaterial production. This collection of instrumentation includes:

(i) the Symphony X solid-phase synthesizer (Gyros Protein Technologies),
(ii) the Nexera preparative HPLC (Shimadzu),
(iii) the Nexera analytical HPLC (Shimadzu),
(iv) the Swing XL automated chemistry platform (Chemspeed Technologies),
(v) the R-series flow chemistry system (Vapourtec) with in-line FTIR (Mettler Toledo) and NMR (Magritek),
(vi) a Selekt flash chromatography system (Biotage),
(vii) a V-10 touch evaporator (Biotage), and
(viii) a benchtop freeze dryer (Labconco).

The BioPACIFIC MIP **Additive Manufacturing Facility** (UCSB) includes resources for rapid prototyping, advanced manufacturing, soft lithography, and 3D printing. The facility focuses on designing, building, and maintaining custom 3D printing platforms tailored to specific user-defined applications. Featuring state-of-the-art 3D printing processes, the facility routinely fabricates complex structures from novel bio-derived monomers, exhibiting a diverse range of mechanical, transport, optical, and chemical properties.

The BioPACIFIC MIP **Mechanical Characterization Platform** (UCSB) supports instrumentation for the structural, rheological, and mechanical characterization of materials, with a focus on high-throughput characterization. The available instrumentation includes an optical microscope with customized hardware and software, designed to serve as a first-in-class high-throughput automated microrheology tool for fluids and soft solids. Additionally, the facility is equipped with a high-throughput microindenter, which complements the microrheology tool by allowing for testing of materials much stiffer than possible with the microrheology tool alone. Furthermore, a versatile texture analyzer is available for linear and nonlinear mechanical measurements on solids.

The BioPACIFIC MIP **Small-Angle X-ray Scattering (SAXS) Facility** (UCSB) is a cutting-edge platform for large-length-scale (~1 nm-1000 nm) nanostructure characterization of a broad range of bio-inspired materials. The instrument has been custom-designed and constructed at UCSB to provide the most advanced capabilities for laboratory SAXS, using the brightest liquid metal jet laboratory X-ray source and the largest, most sensitive hybrid pixel photon-counting 2D detector. In many key aspects, the performance of the BioPACIFIC MIP SAXS is comparable to that of a second-generation synchrotron SAXS, enabling laboratory-based, rapid-turnaround/high-throughput SAXS and WAXS data collection to meet the demand of the large research community at BioPACIFIC MIP.

The BioPACIFIC MIP **Living Biofoundry Facility (LBF)** (UCLA) works with users to accelerate the discovery and scale-up production of bio-derived building blocks and biopolymers through automated synthetic biology and microbial engineering. The facility is developing high-throughput methods for gene assembly, amplification, transformation, strain growth, and metabolite analysis, as well as preparing to support a mineable data library of biosynthetic pathways for the production of unique bio-derived monomers.

The BioPACIFIC MIP **Facility for Microcrystal Electron Diffraction (microED)** (UCLA) endeavors to further develop the nascent technology of polymer (along with small molecule and protein) crystallography using diffraction tomography, along with associated processes for sample preparation, data acquisition, and image analysis. The facility provides access to a state-of-the-art microED platform that offers fast and reliable structure determination of a variety of materials, along with cutting-edge phase imaging and 4D-STEM strain mapping.