

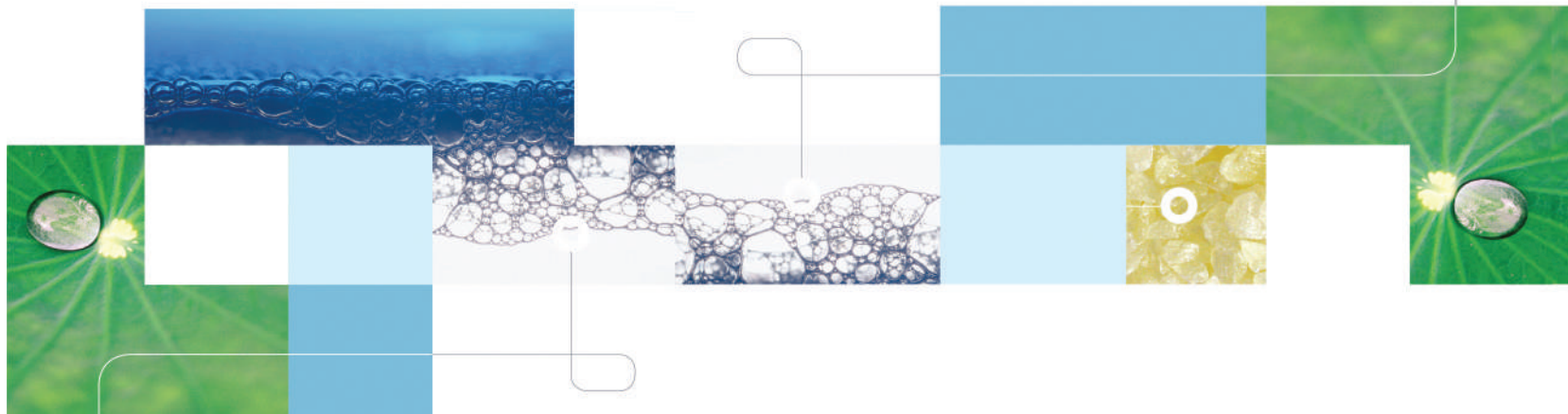


# Toll Manufacturing Services

## From Gram Scale to Tanker Quantities

*Polymer Chemistry Innovations is a world-class manufacturer of monomers and polymers. With two locations and a wide range of equipment and experience, PCI has the technical capabilities to serve our customers' process optimization, advanced distillation, and toll manufacturing needs.*

- **Condensation Reaction Specialists**
- **Fuel-Additive Manufacturing Expertise**
- **Superior Distillation Capabilities**
- **Sulfur-Free Facilities**



**Polymer**  **Chemistry**

*Innovations, Inc.*

[www.polychemistry.com](http://www.polychemistry.com)



## Facilities

### SERVICES

- Toll Manufacturing
- Product Development
- Process Optimization
- Manufacturing Scale-Up
- Research & Analytical Support

### PROCESSING CAPABILITIES

#### POLYMERIZATION

- Ring Opening
- Anionic
- Cationic
- Step Growth
- Radical

#### DISTILLATIONS

- Binary
- Complex Multi-Component
- Azeotropic / extractive
- Continuous, semi-continuous
- Batch, semi-batch

#### SMALL MOLECULE REACTIONS

- Ring Closing
- Alkylation
- Polar (esters, nitriles, ketones, alcohols)
- Condensation

**Polymer Chemistry Innovations has two full-service facilities to meet a diverse set of customer needs.**

### Tucson, Arizona

Polymer Chemistry Innovations' Tucson facility specializes in world-class research and development, custom polymer synthesis, and small-scale production. Our highly experienced team of chemists is available to assist in process optimization, to increase yield and improve efficiency.

A number of analytical capabilities are available in-house, and a close relationship with nearby University of Arizona provides additional analytical characterization if needed.

### Chocolate Bayou, Texas

Polymer Chemistry Chocolate Bayou is a specialty chemical facility located in Alvin, TX – just 35 miles southeast of Houston. This commercial plant offers a unique combination of process development and toll manufacturing on a large scale.

This sulfur-free facility features various high-viscosity stainless steel reactors up to 10,000 gallons, Hastelloy® units that enable work with acid-based products, and a unique distillation tower for ultra-high purity distillations. Our staff can create customized solutions to issues that arise in the process and synthesis of a variety of specialty materials.



# Process Development

## Tucson, AZ

With facilities and equipment ranging from lab-scale, to pilot plant, to fully commercial manufacturing, the PCI team is available to optimize any stage of the development process. We offer the necessary production and analytical capabilities to ensure purity and maximize yield.

The following equipment is available for small and pilot scale production at our Tucson, Arizona facility, in addition to a complete laboratory capable of modeling most processes in glassware.

### ANALYTICAL CAPABILITIES

#### GAS CHROMATOGRAPHY

01 Varian™ series 3500 equipped with FID and TCD detection

#### HPLC (HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY)

01 Waters™ 510 pump with Waters™ 440 variable wavelength UV absorbance detector

#### GPC (GEL PERMEATION CHROMATOGRAPHY)

01 Waters™ 600 pump, 600E solvent controller, and RI detection

#### IR (INFRARED)

01 Beckman™ Acculab-9 continuous wave infrared spectrometer

#### VISCOSITY

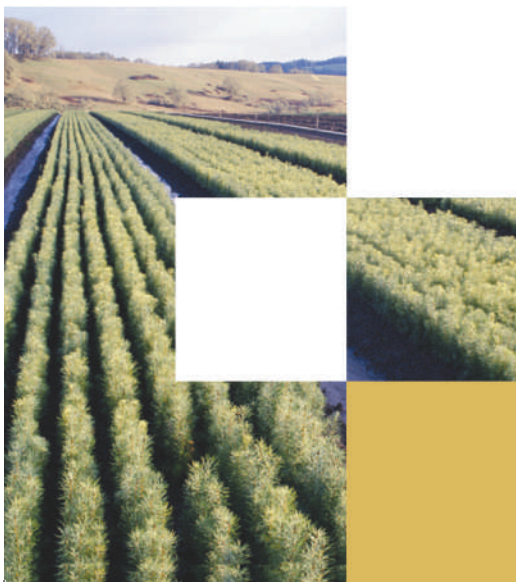
01 Kinematic: Cannon-Fenske capillary method

	ITEM	SIZE	MATERIAL	P RATINGS	T RATINGS
<b>R35</b>	Reactor	35 gal	316L SS	50 psig-FV	450°F
	Medium viscosity, general purpose				
<b>PC 6"x15'</b>	Packed Column	6" x 15'	316L SS	50 psig-FV	350°F
	4 sections, 60 HETP				
<b>R35</b>	Reactor	35 gal	316L SS	50 psig-FV	450°F
	Medium viscosity, general purpose				
<b>PC 6"x4'</b>	Packed Column	6" x 4'	316L SS	50 psig-FV	350°F
	1 section, 15 HETP				
<b>R175</b>	Reactor	175 gal	316L SS	75 psig-FV	500°F
	Medium viscosity, general purpose				
<b>R50</b>	Reactor	50 gal	304 SS	100 psig-FV	500°F
	High viscosity, general purpose				
<b>R06</b>	Reactor	6 gal	304 SS	30 psig-FV	500°F
	High viscosity, 3 heat zones				

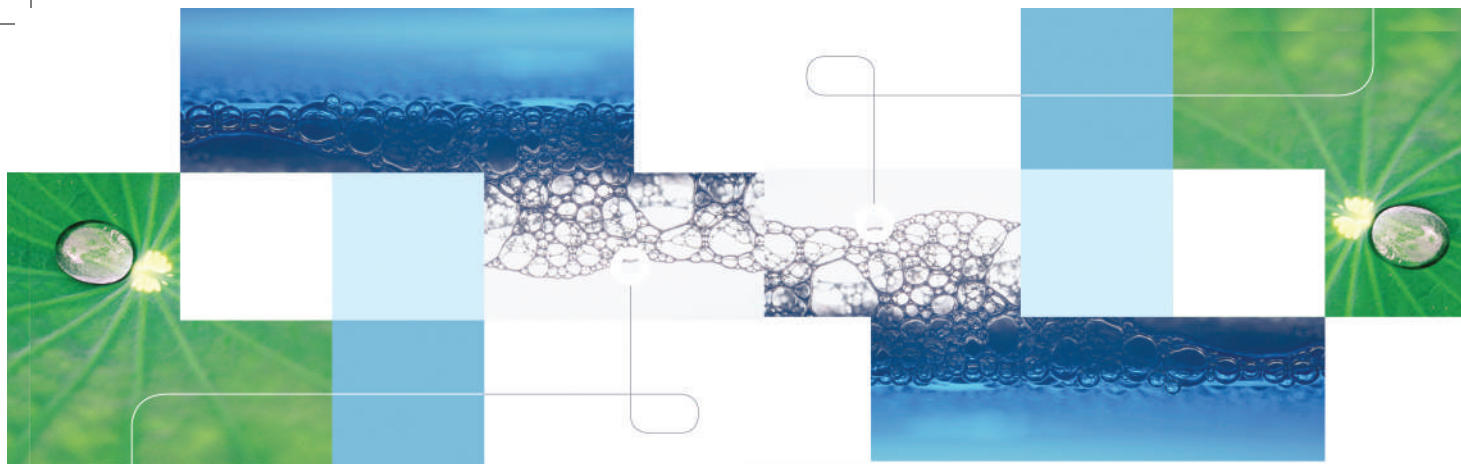
### Additional analytical characterization available through cooperative agreements with The University of Arizona

200-, 300-, 500-MHz instruments available for a variety of one-dimensional and two-dimensional experiments with probes for <sup>1</sup>H, <sup>13</sup>C, <sup>31</sup>P, and <sup>19</sup>F spectroscopy.

200-MHz solid-state magic-angle spinning (MAS) and cross-polarization (CP) for polymer analysis.







# Commercial Production

## Chocolate Bayou, TX

PCI's industrial facilities offer stainless steel reactors up to 10,000 gallons, Hastelloy® reactors and other unique equipment for specialized needs, and excellent access to transportation and raw materials.

The following equipment is available for large-scale production at our Chocolate Bayou, Texas facility, complete with 150,000 gallon tank farm and truck dock shipping facilities.

### EQUIPMENT FEATURES

#### UNIT 100 REACTOR

1,000 ft<sup>2</sup> coils, 50 hp 3-turbine agitator  
**UNIT 100 PACKED COLUMN**  
 1 section, 10 HETP

#### UNIT 200 PACKED COLUMN

4 sections, 77 HETP

#### UNIT 300 PACKED COLUMN

50 HETP

#### UNIT 400 PACKED COLUMN

30 HETP

#### UNIT 500 REACTOR

500 ft<sup>2</sup> tube bundles, jacketed, 40 hp  
**UNIT 500 PACKED COLUMN**  
 4 sections, 35 HETP

#### UNIT 600 REACTOR

High-viscosity polymerization vessel

	ITEM	SIZE	MATERIAL	P RATINGS	T RATINGS
<b>UNIT 100</b>	Reactor	6,000 gal	316L SS	662 psig-FV	600°F
	Packed Column	24" diam	304 SS	75 psig-FV	500°F
<b>UNIT 200</b>	Packed Column	24" diam	316L SS	15 psig-FV	400°F
<b>UNIT 300</b>	Packed Column	24" diam	Hastelloy®	50 psig-FV	425°F
<b>UNIT 400</b>	Packed Column	18" diam	Hastelloy®	50 psig-FV	425°F
<b>UNIT 500</b>	Reactor	10,000 gal	316L SS	100 psig-FV	600°F
	Packed Column	26" diam	304 SS	45 psig-FV	300°F
<b>UNIT 600</b>	Reactor	1,200 gal	304 SS	40 psig-FV	600°F
	Reactor	1,200 gal	304 SS	40 psig-FV	600°F

## Polymer Chemistry

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