**PAL INSTRUMENTATION (11-09-22)**

**Molecular Characterization**

* **THF-GPC-MALS**
	+ FLO-M Vacuum degasser
	+ Agilent 1100 Pump
	+ Agilent 1100 autosampler
	+ Wyatt Dawn-EOS LS Detector
	+ Waters 410 DRI Detector
* **Aqueous-GPC-MALS**
	+ FLO-M Vacuum degasser
	+ Isco Syringe Pumps (500mL)
	+ Manual Injector
	+ Wyatt Dawn-DSP LS Detector
	+ Waters 410 DRI Detector
* **Toluene-GPC-MALS**
	+ FLO-M Vacuum degasser
	+ 2 Isco Syringe Pumps (500mL)
	+ Manual Injector
	+ Wyatt Dawn-EOS LS Detector
	+ Hitachi DRI detector
* **Tosoh EcoSEC Elite HLC-8420GPC with Lens3 Light Scattering Detector**
	+ Vacuum degasser
	+ Pump
	+ Autosampler
	+ Lens3 LS Detector
	+ DRI detector
* **Viscotek TDA-302 Triple detector**
* **Mixed GPC (aqueous or Organic)**
	+ FLO-M Vacuum degasser
	+ Agilent 1100 Pump
	+ Agilent 1100 autosampler
	+ Wyatt Heleos LS detector with DLS Capability and Temp. Control (0 to 60C)
	+ Agilent 1200 DRI detector

**Thermal Analysis**

* **TA Discovery DSC250 Modulated Differential Scanning Calorimeter (DSC)** with Refrigerated System Cooling (RSC-90) -90C to 550C
* **TA Q100 Modulated Differential Scanning Calorimeter (DSC**) with Refrigerated System Cooling (RSC-40) -40C to 400C, or Liquid Nitrogen Cooling
* **TA Discovery TGA550** Modulated High Sensitivity Thermogravimetric Analyzer (TGA) with Modulated TGA mode
* **TA Q800 Dynamic Mechanical Analyzer (DMA) with:**
	+ NPC (Nitrogen Purge Cooling)
	+ ACS-2 Air Chiller System (-55oC)
	+ Compression clamp
	+ Submersion compression clamp
	+ Dual surface film clamp
	+ Single/dual Cantilever Clamp
* **TA Discovery HR 20 Advanced Hybrid Rheometer**
	+ Environmental Testing Chamber (ETC) (-55oC to 600oC)
	+ Upper and Lower Peltier Plates (-40oC to 200oC)
	+ UV Curing Accessory
* **TA Ares Advanced Rheometer AR200 with ETC (Environmental Testing Chamber), Tension and Asphalt Geometries**

**Scattering**

* **Malvern Zetasizer Nano ZS with Titrator**
	+ One angle Backscattering (173)
	+ Zeta Potential
	+ Titrator
* **Multiangle Dynamic/Static Light Scattering System**
	+ Crystal Laser CL-2000 Diode Pumped Laser (532nm, 500mW)
	+ Melles Griot He-Ne Laser (632.8nm, 15mW)
	+ Coherent Innova 90 Ion Laser (488, 514.5, 657 nm, 500mW)
	+ Oriel 77341 PMT
	+ EMI 9863 PMT
	+ Pacific Industries AD-126 Amplifier Discriminator and 126 Lab Photometer
	+ ALV Correlator
	+ Neslab RTE 111 Circulating Bath
* **Thorn EMI Photon Counting System** *( Not in Use***)**
* **Beckman Coulter LS-200 Laser Diffraction Particle Size Analyze**r
	+ Micro Cell Accessory
	+ Dry Powder sampler
	+ Standard Flow sampler

**Microscopy**

* **Olympus BH Polarized Optical Microscope (POM).**
	+ AmScope MD1900 Digital Camera
* **Olympus BX50 Microscope**
	+ Mettler FP82 Hot Stage
	+ Mettler FP80 Central Processing unit
	+ Mettler Photodetector

**Balances**

* **Sartorius A 120 S Analytical Balance (4 decimal)**
* **Cahn C-31 Microbalance (6 decimal)**

**Other Instruments/ Capabilities**

* **Barnstead Nanopure Water System**
	+ With Ultrafilter (0.005µm)
* **Perkin Elmer LS50B Luminescence Spectrometer**
	+ Temperature Control (VWR 1167 Circulating Bath)
* **Agilent 8453 DAD Spectrophotometer**
	+ 7 Multicell Accessory
	+ Temperature Control (VWR 1167 Circulating Bath)
* **Thermo Orion 420 pH Meter**
* **Beckman Microfuge E Micro Centrifuge**
* **IEC Clinical centrifuge**
* **American Scientific BT-23 Thermostated Shaking Bath**
* **Fisher Isotemp Oven (up to ~ 200C)**
* **National Appliance Company 5831 Vacuum Oven (up to ~ 200C)**
	+ Welch Duo-Seal Vacuum pump, Trap
* **VWR Vacuum Oven (up to ~ 200C) (Not in Use)**
* **Sonic VibraCell VC-750 Sonicator**
	+ Several Probes
	+ Sound Proof Cabinet
* **Branson 2210 Sonicator**
* **Solvent Filtering Station**
	+ 1L Organic Flask
	+ 1L Aqueous Flask
	+ GAST Diaphragm Pump
* **Buchi RE-121 Rotovap**
	+ Buchi B-480 Water Bath
	+ Neslab RTE-110 Cooling Circulator
* **NIMA Langmuir Blodgett trough ((Not in use)**

**Other Instruments (NOT PAL)**

* **Bruker EMX 10/2.7 Electron Paramagnetic Resonance (EPR) spectrometer**
	+ 10” magnet
	+ 2.7 kV power supply
	+ Microwave X band solid state bridge
	+ microwave frequency counter
	+ ER 4119HS high sensitivity Resonator
	+ ER 4105DR double resonator
	+ Aquax aqueous solution cell accessory
	+ Liquid nitrogen Cryostat (Not in use)
* **OLIS-RSM-1000 RSM Stopped Flow**
	+ Temperature Control (VWR 1167 Circulating Bath)