

Materials List for:

# Biomass Conversion to Produce Hydrocarbon Liquid Fuel Via Hot-vapor Filtered Fast Pyrolysis and Catalytic Hydrotreating

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URL: <https://www.jove.com/video/54088>

DOI: [doi:10.3791/54088](https://doi.org/10.3791/54088)

## Materials

Name	Company	Catalog Number	Comments
<b>Pyrolysis system</b>			
Feedstock			Mill to pass 2 mm screen
Sand for bed material	Black Rock		Screen to 300-500 microns
Furnace	Thermcraft	TSP-3.75-0-24-3C-J13667/1A	Split tube furnace 3.75 ID X 24 L
Pyrolysis reactor	Custom-built at NREL		2" diameter, height 17", dual staggered plate distributor, 316SS, Auger port is 2.5 cm above distributor and is cooled with air or water, there is a coiled 1/4" 304 SS tube below the distributor to pre-heat the gas
Cyclone	Custom-built at NREL		1" diameter
Cyclone receiver	Custom-built at NREL		1 L capacity
Cyclone secondary receiver	Custom-built at NREL		1 L capacity
Hot vapor filter	Serv-A-Pure	SC2-0P10B34-X	316SS, 10 inches long, 2.0 micron
2-neck round-bottomed flasks			500 ml
Electrostatic precipitator	Allen Scientific Glassware, NREL-built electrodes	Custom built	2" diameter 10" long ground electrode, glass enclosed, stop-cock on bottom
High-voltage power supply	Spellman High Voltage	Bertan 803C-300P	30 kV max, 0.5 mA
Cold-finger condenser	Aldrich	Z164038	
Coalescing filter	Finite	10C15-060	
Dry test meter	American Meter	DTM-200A	with IMAC counter
Gas chromatograph	Varian	CP-4900	MS5A, PBQ, CP-Sil columns
Hydrogen detector	Gerhard Wagner	TCM-4	thermal conductivity detector
Non-Dispersive Infrared Spectrometer	California Analytical	Model 300	Carbon monoxide 0-5%, 0-25%, carbon dioxide 0-5%, 0-20%, methane 0-5,000 ppmv, 0-3%
Mass flow controller	Celerity (now Tylan)	Unit 7301	0-20 SLM reactor bottom, 0-10 SLM auger, 0-2 slm purges, 0-5 slm air
Auger	Auger Manufacturing Specialists	110520	3/8" Dia SS RH Auger 18"
Motor for Auger	Leeson		Gearmotor-Parallel Shaft, 94 rpm, 1/15 HP, TEFC, 115 VAC
Feeding system: Motor for hopper	Lenze	VDE0530	7KB4-7-100H Motor Ac Helical Gearbox 3PH 0.25 kW 1.4/0.82 A
Feeding system: Hopper and Loss in weight feeder	K-TRON Soder	KCL24T20	with K10S controller

Feeding system: Valves	Swagelok	SS-65TS16	151 bar at 37 °C and 6.8 bar at 232 °C
Control system	Opto22	SNAP-PAC parts	
Heat cables	McMaster-Carr	4550T152 and similar	Extreme-Temperature (1,400 °F), heavy insulation for use on metal
Ball Vibrator	Vibtec	K 8	
U-tube	Custom-built at NREL		1/4" PFA and stainless steel tubing, 1.4 m tall
<b>Hydrotreating system</b>			
Ru on carbon catalyst	Fabricated at PNNL		7.6 wt% Ru on carbon
3% Co and 9% Mo on Al <sub>2</sub> O <sub>3</sub> catalyst	Alfa-Aesar	45579	Cobalt oxide, typically 3.4-4.5%, Molybdenum oxide typically 11.5-14.5% on alumina
Feeding pumps	ISCO	500D	Syringe pump, 500 ml cylinder capacity
Mass flow controller	Brooks	SLA5850S1BAF4B1A1	
Temperature controller	Cole-Parmer	WU-89000-10	Digi-Sense Advanced Temperature Controller, 115 V
Thermocouples	Omega		K-type thermocouples
Pressure transducer	Omega	PX309-3KG5V	
Heat tapes	Cole-Parmer	EW-03106-27	Dual element heating tape, 1/2 in x 12 ft, 936 watts, 120 VAC w/ 2-prong plug
Digital pressure gauge	Omega	DPG4000-3K	High Accuracy Digital Pressure Gauge, with Data Logging Capability
Back pressure regulator	Mity-Mite		
Gas flow meter	Mesa Labs	200-220L	Dry Cal, Definer 220 Low Flow
Hydrotreating reactor, cross, tee, fittings	Parker, Autoclave		
Combustible gas sensor	SMC	5100-02-IT-S1-01-00-0-0	Combustible gas detection sensor, 24 VDC power, analog 4-20 MADC output with modbus, no relays
H <sub>2</sub> S sensor	SMC	5100-05-IT-S1-01-00-0-0	H <sub>2</sub> S toxic gas sensor module, 24 VDC power, analog 4-20 MADC output with modbus, no relays
Ventilation sensor	TSI	FHM10	Fume Hood Monitor FHM10
Micro-Gas chromatograph	Inficon	Inficon 3000	Four-channel micro-GC with molecular sieve, Plot U, Alumina, and Stabilwax columns
Lab-view based monitoring and controlling system	Custom-built at PNNL		Using National Instruments parts and Labview software