



Team 13: 3D-Printed Micro Reactor

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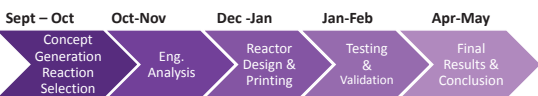
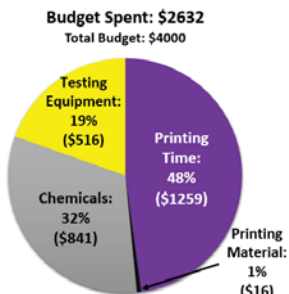
Objective
Design, fabricate and test a compact, metal 3D printed, continuous-flow micro reactor for specialty chemical production

Continuous-Flow Micro Reactor Benefits
Decrease diffusion time/Increase reaction speed
Accelerate chemical development processes
Well-suited for pharmaceutical applications

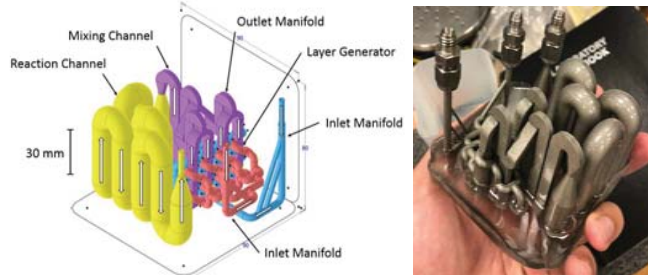
Functional Requirement	Measurable Engineering Specs.	Design/Limit	✓ Pass ✗ Fail
Maximize Production Rate	Flow Rate	~2.5 mL/min	✓ (2.7 mL/min)
	Max Pressure Differential	≤ 200 kPa	✓ (~ 200 Pa)
	Yield	≥ 95%	✓ (90 ± 6%)
	Residence Time	~ 16 min	✓
Lightweight	Max Size	90x90x80 mm ³	✓
	Max Weight	< 1300 g	✓ (~ 300 g)
Safe/Reliable	Max Pressure	3 MPa	N/A
	Min. Leak Pressure	300 kPa	✓

Safety Considerations

- Metal Powder (316L) PPE
- FRC
- Full Face Respirator
- Toluene & DIBAL Handling
- Fume Hood
- Glove Box

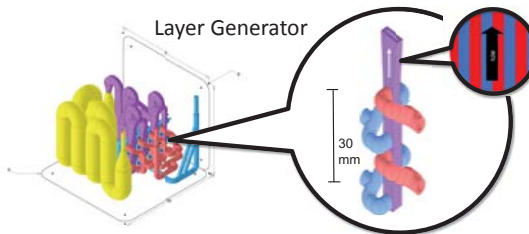


Continuous-Flow Micro Reactor

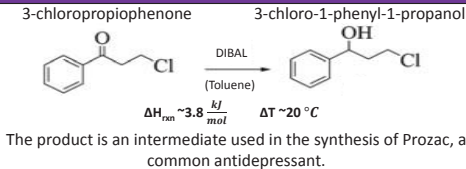


CAD Model Acrylic Coated Printed Micro Reactor

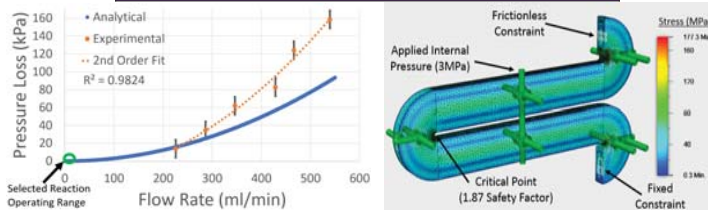
Design to Increase Reaction Speed



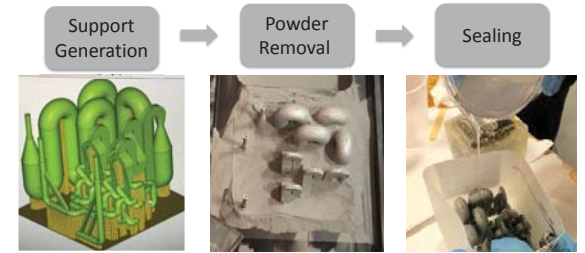
Reaction Selection



Fluid and Structural Analysis



3D Metal Printing is NOT Trivial



Geometric and support design for printability Design to prevent blockages Sealing required due to porous print material



Defect due to improper support placement Defects due to improper STL processing Dye seeping through porous print material

Preliminary Reaction Testing



Micro vs. Batch

