

Progress Reports are graded on the (i) write-up of what has been accomplished and (ii) the amount of said progress on the overall project.

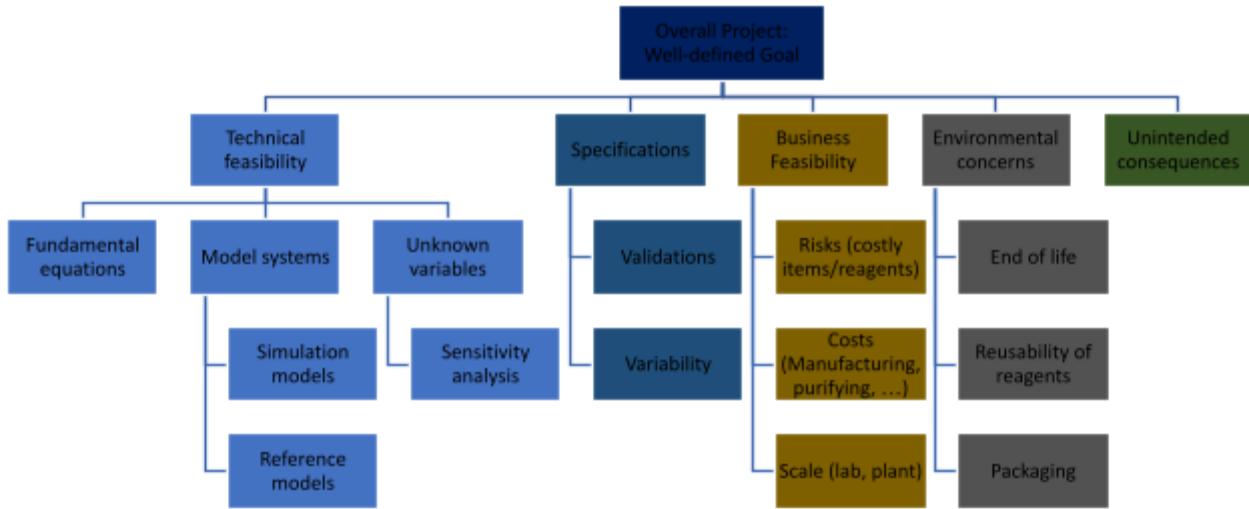
1. Group Number and Title: Group 11 – Sustainable Polymers

2. Week 4/16 and Date: 2/21/2025

<b>Understand</b>	<b>Synthesize</b>	<b>Ideate</b>	<b>Prototype</b>	<b>Implement</b>
Explore	Debrief	Brainstorm	Create	Support
Observe	Organize	Propose	Engage	Sustain
Empathize	Define	Plan	Evaluate	Evolve
Reflect	Interpret	Narrow Concepts	Iterate	Execute

3. Provide a brief list of activities that were done and their corresponding HCD space(s) and subspace(s) (add rows if necessary):

Activity	HCD space(s)	HCD subspace(s)
DSC characterization	Prototype	Evaluate
Melt indexer testing	Ideate	Plan/Narrow concepts
3D printed extrusion piece	Prototype	Create
Research into polymer extrusion	Understand	Explore
OM Imaging	Prototype	Evaluate
Looked into alternative mechanical testing options (i.e. the resin/composite idea)	Ideate, Understand, Synthesize	Brainstorm/plan, Explore, Organize
Degradation testing	Prototype/ implement	Evaluate, Execute
SEM Imaging	Prototype	Evaluate
Updated the budget with actual purchases and costs	Synthesize	Organize



4. What branches/blocks were work focused on this week?

Technical feasibility - model systems (reference models)

Specifications - validations and variability

Environmental concerns - end of life

5. What was accomplished? (4-5 bullet points, include data/charts if applicable)

- DSC was performed on PLA-35wt%PEG (35PEG) and PLA-5wt%PEG (5PEG). The preliminary glass transition temperature was found to be 48.39C for the 35PEG and 60.93C for the 5PEG.
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- OM images were taken of the fibers:



^^ working on adding the scale bar and taking measurements

- Printed the melt indexer component for extrusion.

6. What challenges occurred that were overcome? (3-5 bullet points)

- Found initial data that shows PLA + PEG polymer blends decompose at industrial compost conditions
  - The blend had 14% weight loss, cotton only had 8.8%
    - This 14% weight loss is suspicious so we will be adding more samples
- Printed melt indexer component was finally printed successfully.
- Initial DSC data of the 5PEG sample seem not to show any glass transition up until 75°C, although PLA has a Tg of ~60°C. However, after closer inspection, there was a small bump in the curve at about 60°C which likely corresponds to the Tg.
- Found ASTM standard for testing a single fiber:  
<https://cdn.standards.iteh.ai/samples/5033/8d1b458f916e475a84171d22c731ce31/ASTM-D3822-01.pdf>

7. What challenges are still outstanding? (2-5 bullet points)

- SEM charging of samples
- Still waiting for electrospinning training from MRL
- Need to decide on mechanical testing protocol
- Cleaning melt indexer and establishing cleaning protocol

8. What feedback did you obtain from the instructor or TA last week?

- Get equation for drawing fibers from literature for glass fibers
- Look into making composite samples into a dogbone by placing fibers into a polymer resin and using composite equations to find the modulus of the fibers
- Check budget and make sure we're doing fine on that

9. How have you addressed said feedback in your work this week?

- The budget was updated and we are currently \$27.87 below the budget. However, the budget is still taking into account electrospinning training and usage + AMTEL testing. If these pieces of equipment are not used, we will be well below the budget limit.
- Started a template for the midterm presentation.
- Looked into possible materials to purchase to make the grips for tensile testing fiber bunches, looked for ASTM standards on single fiber testing