CRTM Phases

- Phase 1: Injection
- Phase 2: Gap closing
- Phase 3: Compaction

Phase 2 Study

Non dimensional behavior equations:
- Pressure distribution:
  \[ \frac{\partial \bar{p}_{fluid}}{\partial \bar{z}} = \alpha \left( \frac{\nu_f}{\nu_f} \cdot \frac{\partial \bar{p}_{fluid}}{\partial \bar{z}} \right) \]
- Flow front progression:
  \[ \frac{\partial \hat{L}}{\partial \bar{t}} = \gamma \left( \frac{\partial \bar{p}_{fluid}}{\partial \bar{z}} \right) \]

Boundary conditions:
- \( \bar{z} = 0 \Rightarrow \bar{p} = 1 \)
- \( \bar{z} = 1 \Rightarrow \bar{p} = 0 \)
- \( \bar{i} = 0 \Rightarrow \bar{p} = 1 - \bar{z} \)

Parametric Study

- Displacement vs. compliance
- Filling time vs. compliance
- Displacement vs. Pressure Ratio
- Filling time vs. Pressure Ratio

Material Characterization

- Compaction
- Permeability

Experimental setup

- Front view
- Side view

Experiment / Simulation

<table>
<thead>
<tr>
<th></th>
<th>Experiment</th>
<th>Simulation</th>
</tr>
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<tbody>
<tr>
<td>Initial thickness (mm)</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Final Thickness (mm)</td>
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<td>8.3</td>
</tr>
<tr>
<td>Filling time (s)</td>
<td>3.3</td>
<td>6.6</td>
</tr>
</tbody>
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Future Work

- Include the phase two behavior in the CRTM code.
- Verify the results:
  - on a larger scale experiment
  - on more complex parts
- Conduct a study on injection nodes to increase process speed.

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