### H(a) Additive Manufacturing by Photopolymerization

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<table>
<thead>
<tr>
<th><strong>Description:</strong></th>
<th>Identifying the factors that influence dimensional control and cure depth in additive manufacturing by stereolithography using alumina suspensions.</th>
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<tbody>
<tr>
<td><strong>Plan:</strong></td>
<td>Selecting commercial suspensions, identifying quantitative measurements, establishing a fundamental evaluation of tape casting based printer, establishing mixing methods, designing photocurable resins with an optimal dispersing agent, studying cure depth of developed suspensions, and finally, studying dimensional control of developed suspensions.</td>
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<td><strong>How Ours is Different:</strong></td>
<td>Designing characterization metrics and developing a high degree of dispersion formulations.</td>
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| **Milestones:** | 7/18: Established a candidate commercial slurries and defined testing methods.  
8/18: Evaluated the role of three roll mill parameters.  
12/18: Evaluated the role of DAC mixer parameters.  
1/19: Designed methods for a degree of dispersion evaluation.  
6/19: Established a fundamental evaluation of tape casting based printer and baseline printing parameters.  
7/19: Defined resin materials and their properties for formulation developments.  
9/19: Established dispersing agents for ceramic formulations.  
2/20: Established the effect of the compositional and printing variables on dimensional control.  
7/20: Established the effect of compositional variables on cure depth.  
11/20: Established debinding profile for prints with 5 mm height with 20 µm layer thickness.  
12/20: Defended the dissertation. |
| **Deliverables:** | Establish printing conditions, testing methods, and resins. |
| **Budget:** | **Potential Member Company Benefits:** SLA is a great interest of major industries such as electronic, medical, aerospace and defense because SLA provides a high degree of design freedom and resolutions. |
| **Economics:** | May provide insight on how to reduce the variations and major issues in the final printed objects. |
| **Progress to Date:** | • Published work:  
  • Publication in work:  
  • Developed formulations with a high degree of dispersion  
  • Established cure depth and dimensional control for printing alumina using SLA printer |
| **Knowledge Transfer Target Date:** | Incremental at each semiannual review meeting |

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