Extraordinary Shifts of the Leidenfrost Temperature from Multiscale Micro/Nano Structured Surfaces

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Motivations

Functionalized Surfaces for Tailored Interfacial Transport

- Tailored Wettability
- Directional Surfaces
- Controlled Adhesion
- Anti-Reflection/Wideband Absorption

The Leidenfrost Point and Heat Transfer Applications

Surface Fabrication

- Spectra-Physics Spitfire Laser
  - 50 fs, 1 mJ maximum pulse energy
  - 1 kHz repetition rate
  - 800 nm center wavelength

- Classes of Surface Morphologies

- Raster Path on Sample

Surface Characterization

Leidenfrost Temperature Measurements & Shifts

<table>
<thead>
<tr>
<th>Sample Name</th>
<th>Fluence (J/cm²)</th>
<th>Shots</th>
<th>Average Height (µm)</th>
<th>Surface Area Ratio</th>
<th>Surface Roughness (µm RMS)</th>
<th>Structure Separation (µm)</th>
<th>Contact Angle (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1: BSG - Mounds</td>
<td>1.1</td>
<td>459</td>
<td>15</td>
<td>5.3</td>
<td>4.4</td>
<td>11.3</td>
<td>12</td>
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<tr>
<td>S2: BSG - Mounds</td>
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<td>1359</td>
<td>20</td>
<td>5.0</td>
<td>5.7</td>
<td>11.7</td>
<td>5</td>
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<tr>
<td>S3: ASG - Mounds</td>
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<td>15</td>
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<td>4.5</td>
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<td>S4: ASG - Mounds</td>
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<td>6.0</td>
<td>21.0</td>
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<td>S5: NC - Pyramids</td>
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<td>14</td>
<td>3.5</td>
<td>5.4</td>
<td>24.5</td>
<td>15</td>
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Acknowledgements

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