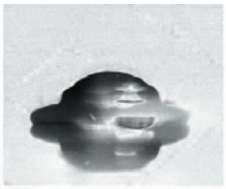


Fig 1: Droplet impact

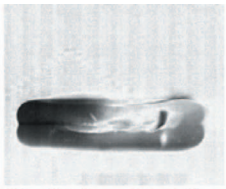


Fig 2: Max. spreading

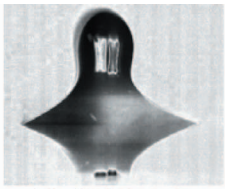


Fig 3: Rebound

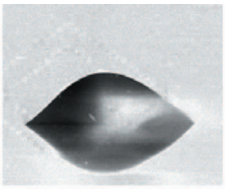


Fig 4: Oscillation

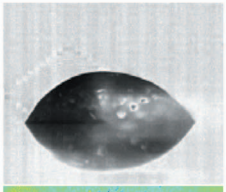


Fig 5: Initial nucleation

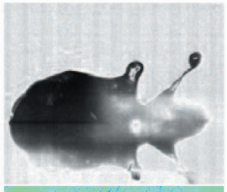


Fig 6: Droplet ejection

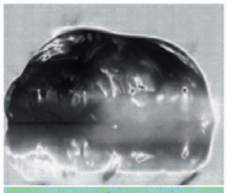


Fig 7: Droplet expansion

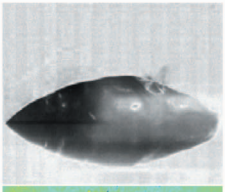
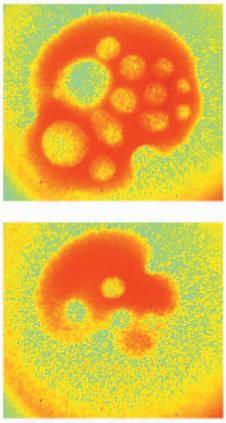
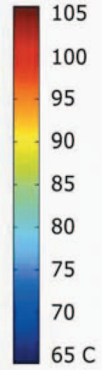
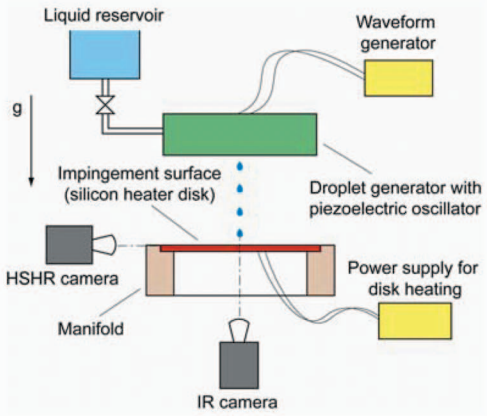


Fig 8: Shrinking height



Figs 9 & 10: Dryout





Test facility for high speed and infrared imaging

Simultaneous Droplet Impingement Dynamics and Boiling Heat Transfer

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Deionized water droplets impinging on a heated, unpolished silicon surface were studied by simultaneously recording the process with a High Speed High Resolution camera (HSHR; 7400 pps; 9 μm/pixel) and an Infrared camera (IR; 120 pps; 10 μm/pixel), as shown above. The HSHR images give information about the impingement dynamics, while the IR images show the heat transfer characteristics of the process. The disk was heated by thin film heaters at the bottom of the disk with a supplied power of 4.7 W. The process is divided into the three stages impingement, boiling, and dryout. During the impingement the droplet impacts on the surface (Fig. 1), spreads out (Fig. 2), rebounds (Fig. 3), and oscillates at a steady diameter (Fig. 4). Boiling involves initial nucleation (Fig. 5) followed by severe boiling including droplet ejection (Fig. 6) and expansion (Fig. 7), and shrinking of the droplet height at constant wetting diameter (Fig. 8). When a critical contact angle is reached, the droplet diameter finally diminishes and dryout occurs (Figs. 9 & 10). The temperatures are based on an intensity-temperature calibration and are the temperatures of the fluid in contact with the surface.

