SUPPORTING DATA

Supporting Figure 1. A CCD image of micron-sized bubbles on an OTS silicon surface undergoing AFM imaging after ethanol-water exchange.
Supporting Figure 2. TM–AFM images of four nanobubbles that were scanned using different set points. Scan size: 1.5μm×1.5μm; Spring constant of cantilever: 0.079 N/m; Scan rate: 1.57 Hz; Drive frequency: 6.58 KHz. Set point ratio: (a)0.926; (b)0.907; (c)0.889; (d)0.870; (e)0.852; (f)0.833; (g)0.796; (h) 0.741. Vertical data scale for all images: 70nm.
Supporting Figure 3. Lift mode images of nanobubbles in ~0.5 CMC Tween 20 solution. The height of the nanobubble measured from the standard TM-AFM image is 44 nm. Scan size of the images: 750nm × 375nm. (a) Normal amplitude image; (b) Lift height: 10nm; (c) Lift height: 20nm; (d) Lift height: 40nm

In order to estimate the real height of nanobubbles lift mode was employed in some experiments. In lift mode a line scan of topographical AFM data is first acquired in tapping mode, and the line is then re-scanned to record the amplitude data with the tip maintained at a constant lift height from the target surface, effectively following the contours of the surface. The drive frequency and drive amplitude used in the lift mode were the same as those used in the main height imaging.

The apparent size of nanobubbles decreased with increasing lift height. The contrast between the nanobubbles and the bare substrate was reversed from bright to dark when the lift height was changed from 20nm to 40 nm. For higher lift heights, up to 160 nm, the contrast between the nanobubbles and the bare substrate remained unchanged. The dark contrast for nanobubbles compared with the bare substrate became weaker with increasing lift height, but the size of the dark area was constant until it disappeared altogether at the lift height of 160 nm. The influence on the image at this remarkably extended range may be a reflection of hydrodynamic effects. The hydrodynamic force can influence the oscillation amplitude in water at separations of several hundred nanometers. Given the totally different boundary conditions expected at solid and gas interfaces (no slip and slip respectively), the observed very low contrast at very large lift heights cannot be taken as an indication of the real height of the nanobubbles.
As such, we believe that the lift height of 20 nm-40 nm, where the contrast flipped, is an approximate indication of the real height of the nanobubble. The real height of a nanobubble can be estimated as the sum of the apparent height in a height image and the lift height where the contrast of the nanobubble has flipped in a lift mode image. So the real height of the nanobubble is around 64nm to 84 nm [= 44nm + (20 to 40) nm]. After reconsideration of the height, the contact angle of nanobubble lies between 126° and 132°.
Supporting Table 1. Details from the profiles of nanobubbles in water imaged at different set point amplitude ratios.

<table>
<thead>
<tr>
<th>Set point amplitude ratio</th>
<th>Radius of curvature*(nm)</th>
<th>Height of nanobubble(nm)</th>
<th>Lateral size of nanobubble(nm)</th>
<th>Nanoscopic contact angle (°)</th>
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<tbody>
<tr>
<td>0.926</td>
<td>1280</td>
<td>26</td>
<td>568</td>
<td>168</td>
</tr>
<tr>
<td>0.907</td>
<td>1480</td>
<td>27</td>
<td>586</td>
<td>169</td>
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<tr>
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<td>27</td>
<td>581</td>
<td>169</td>
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<tr>
<td>0.870</td>
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<td>25</td>
<td>615</td>
<td>170</td>
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<tr>
<td>0.852</td>
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<td>26</td>
<td>603</td>
<td>169</td>
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<tr>
<td>0.833</td>
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<td>25</td>
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<td>170</td>
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<tr>
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<td>170</td>
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<tr>
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<td>28</td>
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<td>169</td>
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<td><strong>Average</strong></td>
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<td><strong>26</strong></td>
<td><strong>591</strong></td>
<td><strong>169</strong></td>
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<td><strong>Standard deviation</strong></td>
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<td><strong>1</strong></td>
<td><strong>15</strong></td>
<td><strong>1</strong></td>
</tr>
</tbody>
</table>

* Radius of curvature is the sphere radius, which fits the cross-section of nanobubbles.