Supporting Information:

Surfactant sculpting of hierarchically structured, biomimetic surfaces

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Figure S1: SEM micrographs of FLA samples taken at 30, 60, and 120 s. Note the emergence of additional levels of hierarchy with increasing time.
**Porous Morphologies**

- **10% C18E2**
- **25% C18E2**
- **5% C16E2**

**Bumpy Morphologies**

- **25% C12E10**
- **25% C18E10**
- **10% C8E4**
- **25% C8E4**

**Figure S2:** Examples of surfactants with negative curvature are shown in the first four SEM micrographs displaying pores, and examples of surfactants with positive curvature are shown in the second four SEM micrographs displaying bumps.
<table>
<thead>
<tr>
<th>C</th>
<th>E</th>
<th>HLB</th>
<th>(H_0/(\text{nm}^{-1}))</th>
<th>(\kappa/ (k_B T))</th>
<th>(\kappa_{\text{splay}}/ (k_B T))</th>
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</thead>
<tbody>
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<td>20</td>
<td>15.5</td>
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<td>10</td>
<td>14.5</td>
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<td>10</td>
<td>13.3</td>
<td>-2.9</td>
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<tr>
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<tr>
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<td>5.2</td>
<td>-0.33</td>
<td>5.7</td>
<td>-4.5</td>
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</tbody>
</table>

**Table S1:** HLB numbers calculated for each surfactant according to Griffin’s method.\(^1\)\(^,\)\(^2\) Also provided are values for the spontaneous curvature \((H_0)\), bending rigidity \((\kappa)\), and saddle-splay constant \((\kappa_{\text{splay}})\) solved numerically according to the method of Bergström.\(^3\)

The set of equations for calculating the elastic bending constants can be solved numerically. When the ratio between the volume of the head group \((v_h)\) and volume of the tail group \((v_t)\) becomes too large, the numerical solution for of \(\kappa\) falls below zero. The negative value gives the incorrect sign for the spontaneous curvature, which is why \(\kappa\) and \(H_0\) are not reported for C12E10, C18E10, and C18E20. Nevertheless, the trends in the calculated elastic constants roughly correspond to those outlined in the manuscript. Namely, the spontaneous curvature is positive when \(v_h/v_t\) is larger, and negative when \(v_h/v_t\) is smaller. Furthermore, higher molecular weight surfactants—particularly those with longer tails—have a higher bending rigidity and saddle-splay constant.
Figure S3. When plotted versus the HLB number and total surfactant length, no general trends occur in the fractal dimension, RMS roughness, surface area ratio, skewness, or kurtosis. The C18E20 sample, however, has atypical skewness and kurtosis.
**Figure S4:** Examples of surfactants that form emulsion droplets and have smooth surface features are shown in the first five SEM micrographs. Examples of surfactants that do not show evidence of emulsion droplets and have surface features resembling buckles are shown in the second set of six SEM micrographs.
**Figure S5**: SEM micrographs illustrate the dramatic changes that occur when only the surfactant concentration is changed.
Figure S6. Fractal dimension, surface area ratio, roughness, skewness, and kurtosis are plotted as a function of surfactant concentration for each surfactant. The effects of concentration vary for each surfactant in a different way.
References

