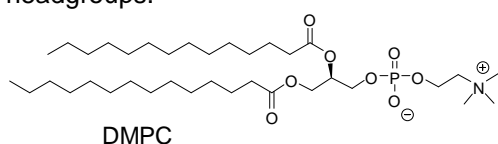


# Technical Note III

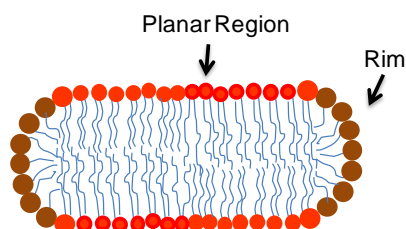
## Bicelles

### What are bicelles

Bicelles are disk-shaped aggregates composed of long-chain phospholipids that make up a planar region and either detergent or short-chain phospholipids that compose flanking rims. The size of bicelles is regulated by adjusting the lipid/detergent ratio and the surface charge can be manipulated by replacing neutral long-chain lipids with phospholipids that have similar diacyl chain lengths but negatively charged headgroups.



DMPG



Schema of bicelle structure

### Benefits of using bicelles

Bicelles are the next generation of biological membrane models that allow a closer look at the structure, dynamics and topology of membrane proteins. Bicelles have an advantage over micelles in their ability to mimic natural membranes and therefore capture membrane proteins in their biologically relevant orientation as demonstrated in structural studies of the transmembrane segment of Integrin  $\beta 3^1$  and functional studies of DAGK<sup>2</sup>. Since the introduction of bicelles for NMR studies of membrane-associated biomolecules<sup>3</sup>, a wide variety of uses in membrane protein science including solution and solid-state NMR and crystallization studies have emerged.

The ability of Bicelles to spontaneously align in a magnetic field has enabled their use in solid-state NMR studies to characterize GPCRs, the trans-membrane domain of Vpu from HIV-1, and cytochrome b(5) to name a few<sup>4</sup>. Bicelles can be made small to attain tumbling times suitable for solution NMR which has been used to investigate human dynorphin A' and B's positions and interaction features in the membrane<sup>5</sup>. More recently, bicelles were used to solve the solution NMR structure of the Bnip3 transmembrane domain dimer revealing that bicelles could facilitate analysis of proteins with more than a single transmembrane helices<sup>6</sup>. Bicelle crystallization was first demonstrated with bacteriorhodopsin from *H. salinarum*<sup>7</sup> and has since been used in studies with xanorhodopsin<sup>8</sup>, the voltage gated anion channel and the  $\beta_2$ -adrenergic G-protein-coupled receptor<sup>9</sup>.

### Anatrace bicelle products

Anatrace offers lipids and detergents that are highly purified to >99% and can be mixed to form bicelles for membrane protein applications. The zwitterionic long-chain phospholipid DMPC and negatively charged long-chain phospholipid DMPG are offered in addition to CHAPS and CHAPSO to support virtually any bicelle application. Both DMPC/CHAPS and DMPC/CHAPSO bicelles have been used directly in crystallization studies and the lipid/detergent bicelles have been shown to impart better stability and density definition in comparison to bicelles rimmed with short-chain phospholipids<sup>8,10</sup>.

<p>D514 1,2-Dimyristoyl-sn-Glycero-3-Phosphocholine <i>DMPC</i> FW: 677.93 C<sub>36</sub>H<sub>72</sub>NO<sub>8</sub>P Purity &gt;99% pH (1% MeOH) 5-8  Solubility MeOH &gt; 20%; Water insoluble Conductance (1% MeOH) &lt;200 μS Absorbance (1% in MeOH):  280 &lt; 0.08 260 &lt; 0.1</p>	<p>C316 CHAPS, ANAGRADE® FW: 614.9 C<sub>32</sub>H<sub>58</sub>N<sub>2</sub>O<sub>7</sub>S CMC (H<sub>2</sub>O) ~ 8 mM<sup>1</sup> (0.49%) Aggregation: (H<sub>2</sub>O)<sup>2</sup> ~ 10 dn/dc (H<sub>2</sub>O)<sup>3</sup> 0.1323 mL/g  Purity ≥ 99% by HPLC analysis pH (1% solution) 5-8 Solubility in H<sub>2</sub>O: 0.5M (30.7%) 340 &lt;0.02 Conductance (0.5 M) &lt; 50 μS Absorbance of 1% solution: 340 nm &lt; 0.02 280 nm &lt; 0.04 260 nm &lt; 0.06</p>
<p>D614 1,2-Dimyristoyl-sn-Glycero-3-[Phospho-rac-(1-glycerol)] (Sodium Salt) <i>DMPG</i> FW: 688.85 C<sub>34</sub>H<sub>66</sub>NaO<sub>10</sub>P Purity &gt;99% pH (1% water) 5-8 Solubility Water &gt; 1%; MeOH soluble with heat  Absorbance (1% in water): 340 &lt;0.02  280 &lt; 0.08 260 &lt; 0.1</p>	<p>C317 CHAPSO, ANAGRADE® FW: 630.9 C<sub>32</sub>H<sub>58</sub>N<sub>2</sub>O<sub>8</sub>S CMC (H<sub>2</sub>O) ~ 8 mM<sup>1</sup> (0.50%) Aggregation: (H<sub>2</sub>O)<sup>1</sup> ~ 11  Purity ≥ 99% by HPLC analysis pH (1% solution) 5-8 Solubility in H<sub>2</sub>O ≥ 0.5M (31.5%) Conductance (0.5M) &lt; 100 μS Absorbance of a 1% solution: 340 nm &lt; 0.02 280 nm &lt; 0.04 260 nm &lt; 0.06</p>
<p>D399-BIC KIT, BICELLE KIT (2 LIPIDS, 2 DETERGENTS) Kit contains 200 mg DMPC, 200 mg DMPG, 1 g CHAPS and 1 g CHAPSO</p>	

## References

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