## SUPPLEMENTARY MATERIALS

**Figure 1S.** <sup>2</sup>H NMR powder-pattern spectra of POPS bilayers in the absence (A) and in the presence (B) of 2 mol% Sap C with respect to the lipids at  $25^{\circ}$ C (solid-line) and  $45^{\circ}$ C (dotted-line).

**Figure 2S.** <sup>31</sup>P NMR powder pattern spectra of POPS MLVs in the absence (A) and in the presence (B) of 2 mol% Sap C with respect to the lipids at temperature range from 25- $45^{\circ}$ C.

**Figure 3S.** <sup>31</sup>P CSA width as a function of temperature (25°C to 45°C) for both POPC (A) and POPS (B) phospholipid bilayers with and without 2 mol% Sap C with respect to the lipids. The open squares (A) and triangles (B) represent POPC and POPS bilayer controls (without protein), respectively. The closed squares (A) and triangles (B) represent POPC and POPS bilayers with 2 mol% Sap C, respectively. The error bars were obtained by averaging CSA values from two different samples.

**Figure 4S**. <sup>31</sup>P MAS isotropic peak positions of (A) POPC and (B) POPS MLVs with (dotted lines) and without (solid lines) 2 mol% Sap C at 25°C.

**Figure 5S.** <sup>31</sup>P NMR powder pattern spectra of pure POPS MLVs prepared without TFE (solid-lines) and with TFE (dotted-lines). In both samples, the lipids were completely dried from solvents (chloroform or chloroform and TFE) using N2 gas and saved in the desiccator overnight before they were resuspended in the buffer (pH 7.0).



## Figure 1S



Figure 3S





Figure 5S

