Supplementary material



**Fig.1:** Liposome size distributions measured by dynamic light scattering (DLS) for extrusion through (a) 1  $\mu$ m and (b) 0.1  $\mu$ m track-etch membranes.



**Fig. 2:** UV-Vis spectra of liposomes loaded with 1 M CaCl<sub>2</sub> and 50  $\mu$ M phenol red before the addition of (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub> (t = 0), after (t = 5 min), t =20 h, and after addition of NH<sub>4</sub>OH. The acid form ( $pK_{a1} = 1.2$ ,  $pK_{a2} = 7.7$ ) of phenol red exhibits broad absorbance around 440 nm and the basic form exhibits a sharp absorbance peak at 560 nm. Although the expected absorbance peaks are obscured by scattering from the liposome suspensions, after (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub> addition the drop in absorbance above 500 nm and increase in the broad peak around 560 nm demonstrates the de-protonation of phenol red due to the increase in pH accompanying diffusion of (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub> into the liposomes. After 20 h, the change in absorbance is reversed, as the pH approaches initial levels, arresting precipitation of CaCO<sub>3</sub>. Addition of 0.3% NH<sub>4</sub>OH restarts the reaction by increasing the pH inside the liposome.

**Table 1:** Average nanoparticle  $(d_{ACC})$  and encapsulating liposome  $(d_{Lipo})$  diameters for precipitation in high and low osmolarity medium. Measurements were made from Cryo-TEM images of liposomes plunge frozen 20 h from the addition 0.5 M (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>. Averages are based on at least 45 measurements.

Osmolarity (Osm/kg)	d <sub>Lipo</sub> (nm)	$d_{ACC}$ (nm)	% Reaction completion*
2.7	$104 \pm 24$	$29 \pm 7$	$47 \pm 16$
3.3	$97\pm20$	$26\pm 6$	$43 \pm 14$
* Calculated assuming $\rho = 2.49 \text{ g} \cdot \text{cm}^{-3}$ and $[\text{Ca}^{2+}] = 1 \text{ M}$			