Supporting information:

The lateral diffusion constant (D_L) of the fluorescent probe molecule have been calculated by the following procedure:

By using eq (i) we have calculated τ_m value; $\tau_m = \frac{4\pi\eta r_h^3}{3KT} \ldots (i)$, where η=viscosity of the medium (water), r_h= hydrodynamic radius of the SUV, *K*= Boltzmann constant, T=absolute temperature, τ_1 and τ_2 are fast and slow component of anisotropy decay ;

Again, by using the value of τ_m, we have obtained the τ_D value with the help of eq. (ii);

$\frac{1}{\tau_D} - \frac{1}{\tau_2} - \frac{1}{\tau_m}$ … (ii) where (τ_m) =time constant for overall rotation of the vesicles and (τ_D) lateral diffusion of the probe.

Lastly we have obtained the D_L value by using the τ_D and r_h values with the help of eq. (iii);

$D_L = \frac{r_h^2}{6\tau_D} \ldots$ (iii)