Supplemental Information

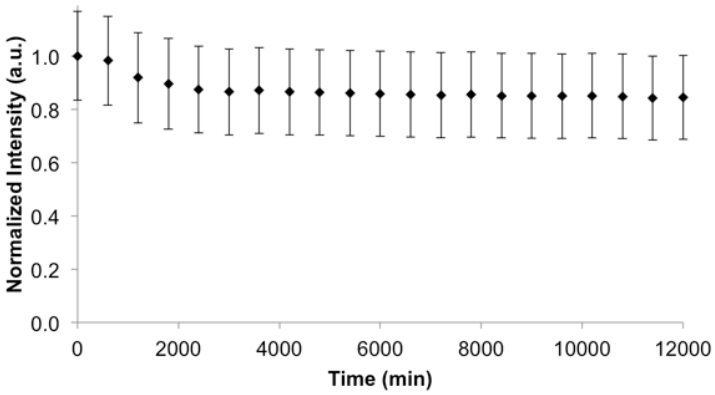

Figure S1. BODIPY emission in a single DLPC bilayer. The normalized fluorescence of BODIPY 665/676 within a supported lipid membrane does not vary significantly in the absence of free radical generators.

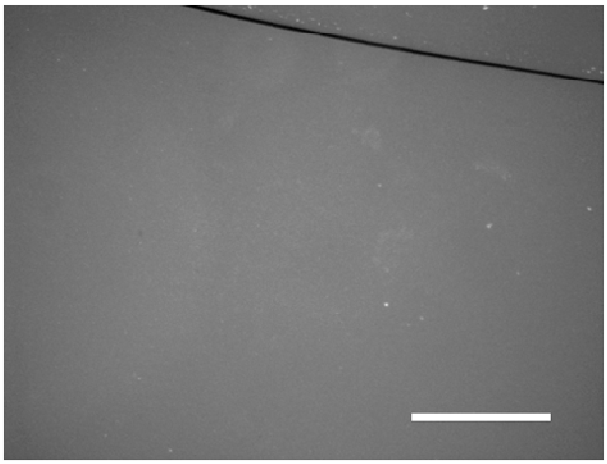

Figure S2. Focused image of a scratched region on a DLPC bilayer supported on a glass substrate. Fluorescence emission comes from 0.5mol% of BODIPY 665/676 embedded in the bilayer before vesicle fusion. Inset scale bar is 100μm.

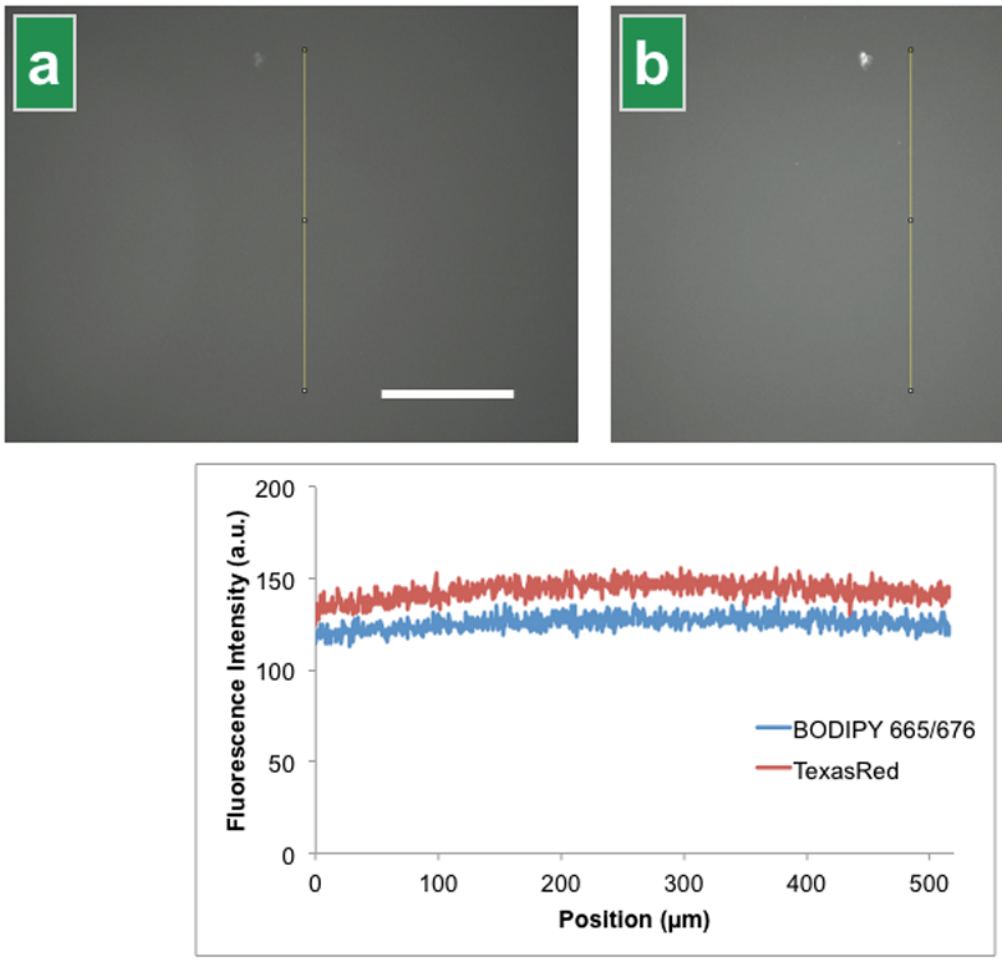

Figure S3. Spatial distribution of BODIPY and TexasRed fluorescence emission in two bilayer sample. Here the emission of the fluorophores embedded in a basal DLPC membrane (BODIPY) and distal DLPC membrane (TexasRed) show good spatial homogeneity. Scale bar is 100µm.

Table S1 - Results of monoexponential decay fit based

Sample	y0	a	b (s^{-1})	R^2	1/e (hr)	Normalized 1/e
DLPC	1.72E-02	1.04E+00	2.94E-04	0.99	0.98	1.00
DLPC-CH	-1.71E-01	1.18E+00	1.23E-04	1.00	2.64	2.69
DPPC	-1.43E-01	1.17E+00	1.19E-04	1.00	2.71	2.77
2layer-DLPC	1.17E-01	9.26E-01	2.357E-04	0.99	1.54	1.51
DLPC-vitE	1.88E-01	2.11E+01	1.38E-04	0.99	9.40	9.22
DLPC-Trolox	-2.76E-02	1.54E+00	2.27E-04	1.00	1.62	1.59

Table S2 – Raw ellipsometric measurements

	Delta	**Psi**
Double bilayer	175.08	25.74
	175.41	25.75
	174.91	25.72
	175.23	25.71
	175.52	25.73
Single bilayer	176.77	25.73
	176.75	25.69
	177.01	25.71
	176.98	25.71
	176.66	25.72

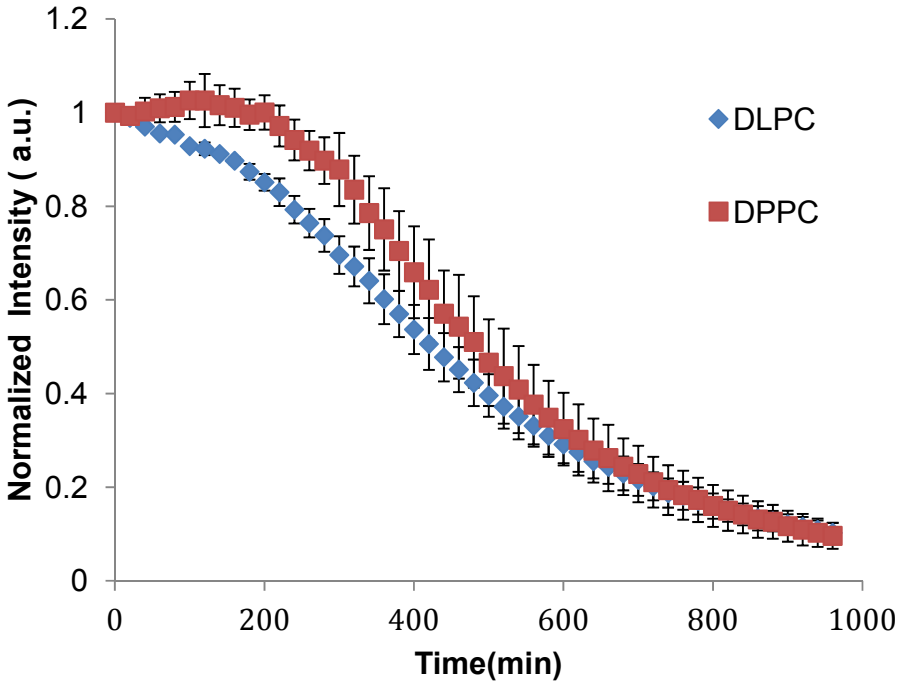

Fig S4: Differences in rate of permeation of free radicals across DLPC and DPPC stabilized emulsions. The radical permeation rates were determined using the peroxidation sensor dye encapsulated in the oil phase of the oil in water emulsion. The free radicals were generated in the aqueous phase of the emulsion using AAPH (10 mM).

Experimental protocol to form these emulsions with DLPC and DPPC based emulsifiers was based on the procedures described in our previous study [12].