Supporting Information

The Capture and Stabilization of Curcumin Using Hydrophobically Modified Polyacrylate Aggregates and Hydrogels

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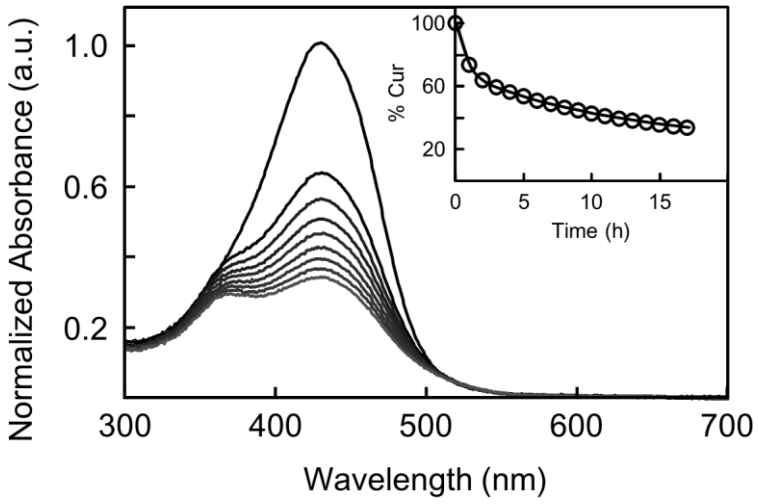

Figure S1. UV-Vis absorption spectra of 30 μM curcumin in 2.9 wt%, at 37 °C. Signals were recorded for 18 h. The inset shows the decay of the absorption maxima due to decomposition of curcumin. The 2.9 wt% PAAC12 possesses an equivalent number of carbon atoms on the substituent as 2.0 wt% PAAC18. The 2.9 wt% PAAC12 shows a similar viscosity as 1.0 wt% PAAC18 in a previous study. However, PAAC12 exhibits insignificant suppression of curcumin decomposition at 37 °C.

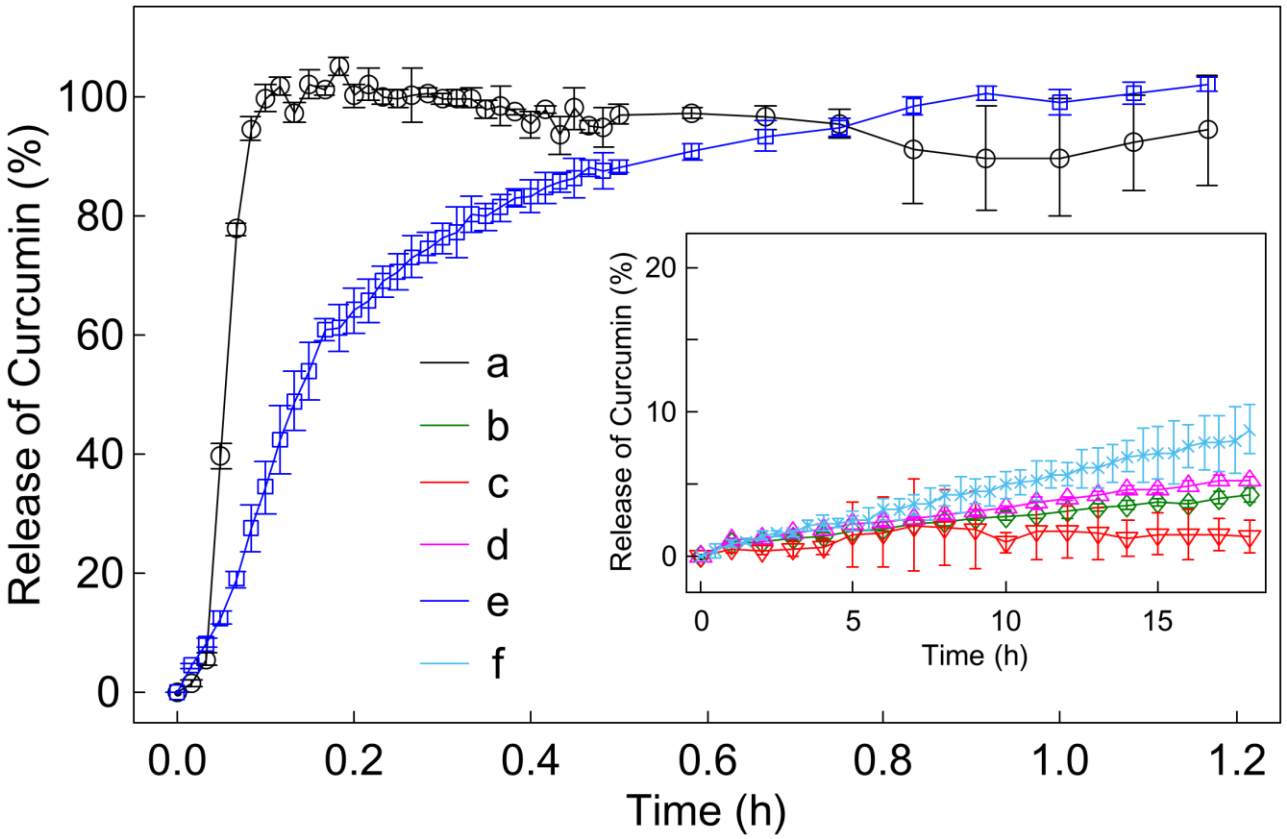

Figure S2. Release kinetics of curcumin in (a) pH 7.4 phosphate buffer solution, those in PAAC18 at (b) 0.3 wt%, (c) 1.0 wt% and (d) 2.0 wt%, and those in (e) PAAC12 at 1.0 wt% and (f) 10%-PAAC12 at 0.5 wt%, at 37 °C. The kinetics were determined by the evolution of the absorbance around 350 nm with respect to the maximum absorbance of curcumin around 430 nm. Absorbance around 350 nm corresponds to degradation products of curcumin as a result of its release from the polyacrylate micelle-like aggregates or hydrogels. Curcumin in buffer (a) shows rapid formation of degradation products.[21-23] Curcumin in PAAC18 (b - d) shows sustained release profiles over 18 h. PAAC12 releases curcumin rapidly (e) within 1 h, while 10%-PAAC12 exhibits a sustained release of curcumin (f).

Table S1. Binding constants, K_n, of PAAC18-curcumin complexes for n = 1–10.

n	K_n ($\times 10^4$ M^{-1})
1	–
2	0.36 ± 0.01
3	0.70 ± 0.01
3.5	1.04 ± 0.01
4	1.48 ± 0.06
4.25	1.65 ± 0.06
4.5	1.85 ± 0.10
4.75	2.06 ± 0.13
5	2.08 ± 0.13
5.25	1.86 ± 0.18
5.5	1.67 ± 0.26
5.75	1.39 ± 0.18
6	1.36 ± 0.12
6.5	1.14 ± 0.15
7	0.92 ± 0.09
7.5	0.85 ± 0.08
8	0.75 ± 0.06
9	0.67 ± 0.05
10	0.61 ± 0.05

Table S2. Chemical shifts of curcumin (1,7-bis(4-hydroxy-3-methoxyphenyl)hepta-1,6-diene-3,5-dione) in different solvent systems and 1.0 wt% PAAC18

		Chemical shifts (ppm)		
Curcumin Hydrogens		*d_6*-DMSO	$CDCl_3$	PAAC18 in D_2O
trans	H1, H7	7.55	7.57	7.39
Ph	H5	7.32	7.32	6.80 – 6.97
Ph	H1	7.15	7.16	
Ph	H2	6.82	6.85	
trans	H2, H6	6.76	6.76	6.40
alpha	H4	6.06	6.06	*D-Exchange*
methoxy		3.90	3.85	3.82

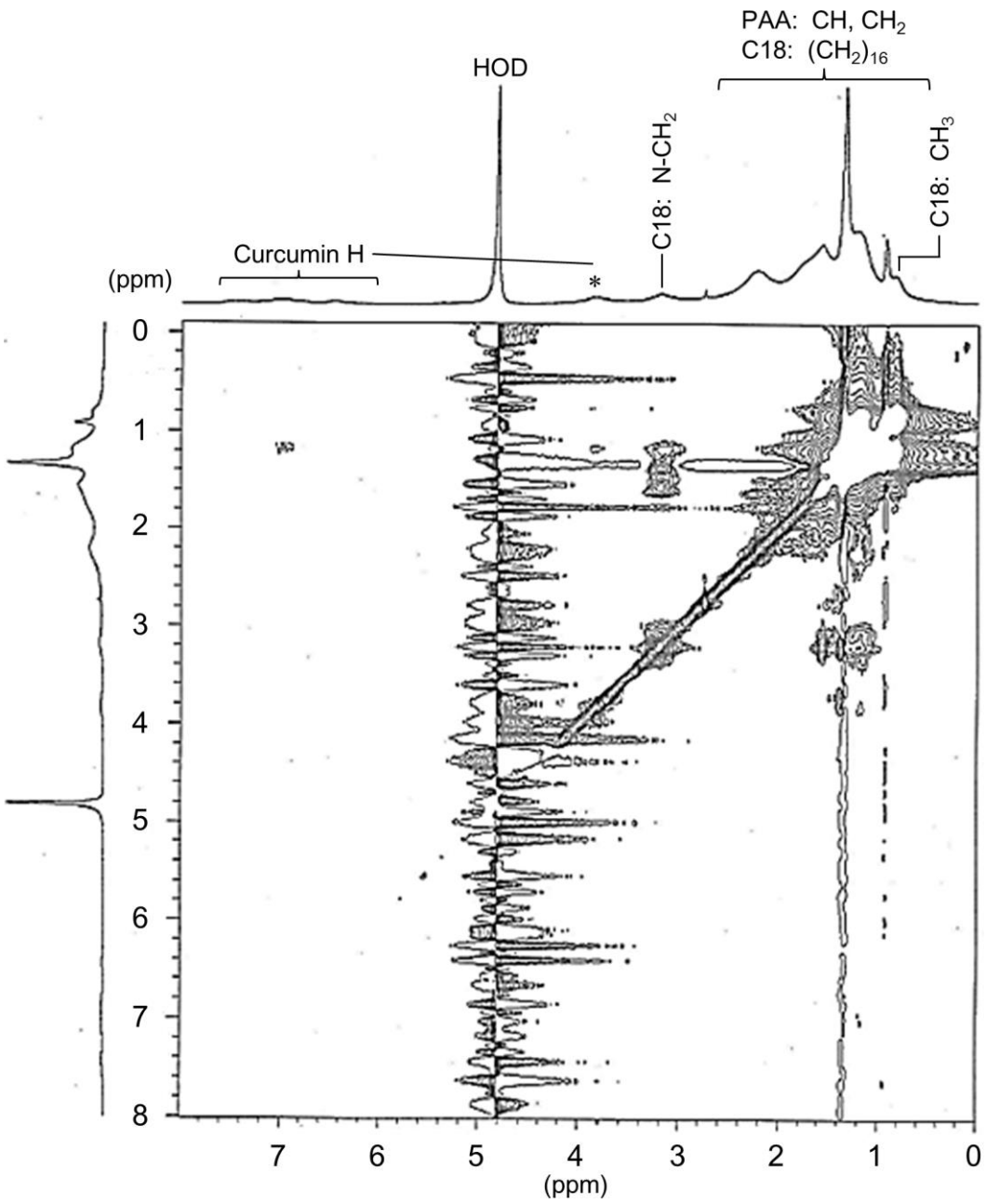

Figure S3. 2D NOESY ^{1}H NMR spectrum of curcumin in 2.0 wt% 10%-PAAC12 in D_2O at pD 7. No cross-peaks arising from the interactions between the dodecyl substituent protons and the curcumin CH and CH_3O (as indicated as asterisk) are observed.