

Hydrogel Contact Lenses Embedded with Amine-Functionalized Large-Pore Mesoporous Silica Nanoparticles with Extended Hyaluronic Acid Release

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Table S1. The N₂ adsorption–desorption parameters of different functionalized LPMSNs.

Sample	BET surface area S_{BET} (m ² /g)	BET pore volume V_p (cm ³ /g)	BJH pore diameter V_{BJH} (nm)
LPMSN-siloxane	518.21	1.20	33.1
LPMSNs-amine	176.80	0.76	31.6

Abbreviations: BET, Brunauer-Emmett-Teller; BJH, Barrett-Joyner-Halenda.**Table S2.** HA/PBS solution with different pH values for all CLs.

Sample	Uptake pH Environment	Loaded HA on 24 h [μg/lens] ^{a)}	Total Released HA in ALF on 120 h [μg/lens]	Released 80% HA Drug	Released HA Enhancement ^{b)}
Standard CLs	5.5	25.7	21.9	8 h	—
	6.5	30.2	26.4	3 h	—
LPMSN-siloxane CLs	5.5	80.3	70.8	13 h	3.2-fold
	6.5	65.5	57.3	10 h	2.2-fold
LPMSN-amine CLs	5.5	281.2	275.6	82 h	12.6-fold
	6.5	95.6	87.2	60 h	3.3-fold

^{a)} HA/PBS solution with different pH value is fixed at 0.1 wt% carried out 3 mL for uptake. ^{b)} Released HA enhancement values are calculated by comparing them to standard CLs.**Table S3.** Kinetic fitting data of desorption between hydrogels and HA for pH 5.5.

Sample	Pseudo First-Order Model			Korsmeyer-Peppas Model		
	k_1	Q_e	R^2	n	k_{kp}	R^2
Standard CLs	0.20±0.02	23.78±0.23	0.94	0.06±0.02	18.55±1.74	0.77
LPMSN-siloxane CLs	0.09±0.00	70.75±0.59	0.98	0.19±0.03	30.56±3.81	0.82
LPMSN-amine CLs	0.01±0.00	379.61±6.63	0.999	0.71±0.01	9.57±0.57	0.995

Table S4. Kinetic fitting data of desorption between hydrogels and HA for pH 6.5.

Sample	Pseudo first-order model			Korsmeyer-Peppas model		
	k_1	Q_e	R^2	n	k_{kp}	R^2
Standard CLs	0.63±0.06	26.35±0.08	0.99	0.02±0.0	24.32±0.33	0.98
LPMSN-siloxane CLs	0.13±0.01	54.01±0.36	0.98	0.14±0.01	29.60±1.72	0.94
LPMSN-amine CLs	24.94±0.00	66.23±3.30	0.31	0.37±0.01	15.31±0.82	0.99

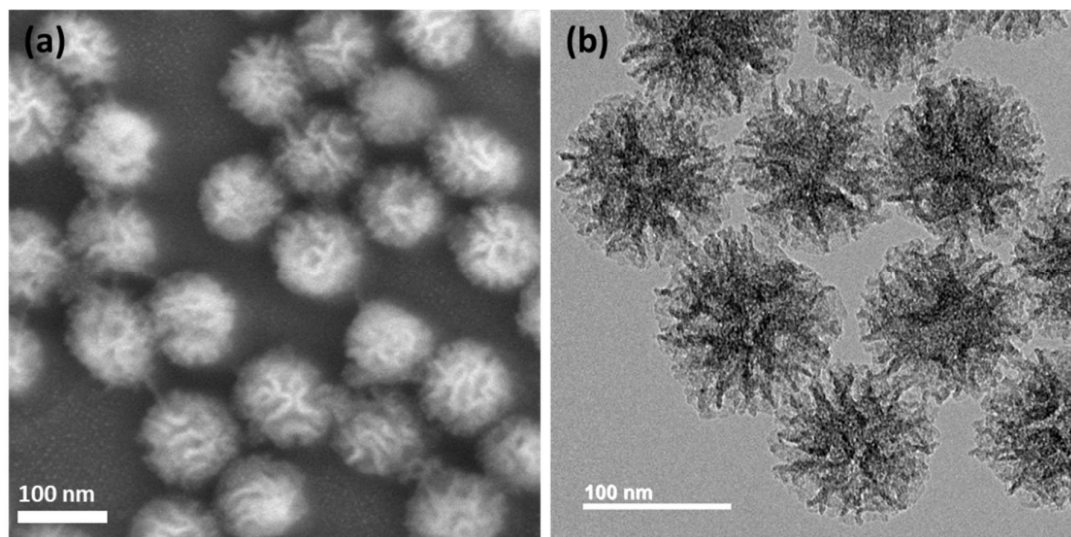


Figure S1. (a) FESEM and (b) FETEM images of the LPMSN-siloxane.

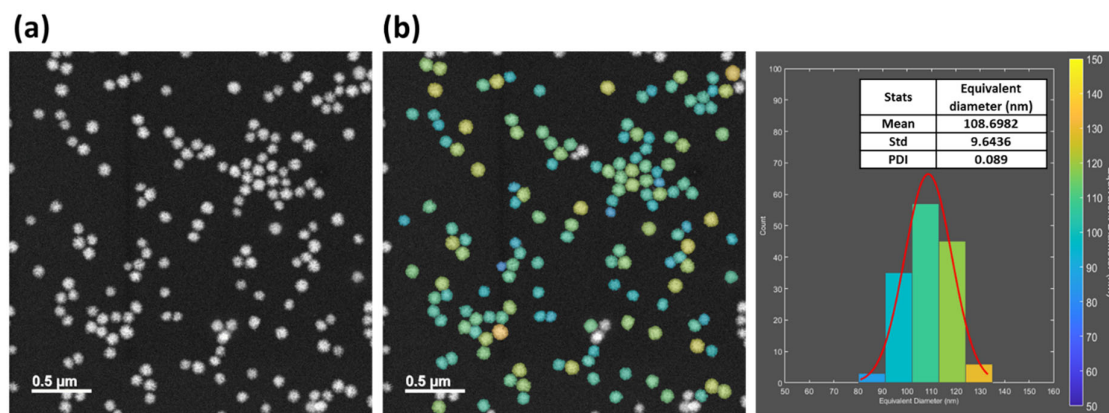


Figure S2. Particle size distribution calculated from FETEM pictures. (a) FETEM image and (b) histograms of particle size distribution of LPMSN-amine.

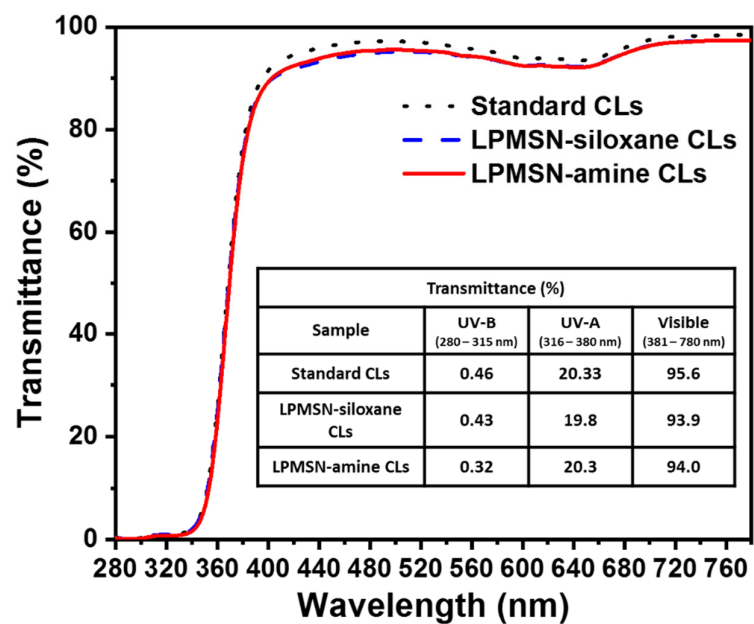


Figure S3. Transmittance spectra of the all fabricated CLs. Inset shown the transmittance of different wavelength range. (Average, $N = 6$).



Figure S4. Water contact angle photographs of (a) the standard, (b) the LPMSN-siloxane, and (c) the LPMSN-amine CLs without HA, respectively.