Electronic Supplementary Material (ESI) for Soft Matter.

Supplementary Information

Amorphous Nanoparticles by Self-assembly: Processing for Controlled Release of Hydrophobic Molecules

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Information of AFFINSOL™ HPMCAS

Table S1. Specification of AFFINISOL™ HPMCAS (https://www.dow.com/en-us/pharma/products/affinisol)

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	AFFINISOL™ HPMCAS		
	716	912	126
Hydroxypropyl	5.0-9.0%	5.0-9.0%	6.0-10.0%
Methoxyl	20.0-24.0%	21.0-25.0%	22.0-26.0%
Viscosity*	2.4-3.6 cP	2.4-3.6 cP	2.4-3.6 cP
Residue on Ignition	<0.20%	<0.20%	<0.20%
Loss on Drying	<5.0%	<5.0%	<5.0%
Free Acids	<1.0%	<1.0%	<1.0%
Acetate Substitution	5.0-9.0%	7.0-11.0%	10.0-14.0%
Succinate Substitution	14.0-18.0%	10.0-14.0%	4.0-8.0%
Acetic Acid	0.5%	0.5%	0.5%

Calculation of effective Reynolds number for MIVM

The definition of effective Reynolds number is

$$Re = \sum_{i=1}^{4} \frac{U_i D_i}{\nu_i}, \quad (1)$$

where U_i is the velocity, ν_i is the kinematic viscosity of stream i, and D_i is the characteristic dimension [1]. The current MIVM set-up has a cross-section area of each inlet as 1.1×1.5 mm,^{2} and the diameter of the mixing geometry as D_i=6 mm. Tables S2, S3 and S4 list the flow velocities and kinematic viscosities of each stream for HPMCAS, zein and lecithin NPs. Therefore, the effective Reynolds numbers are Re=1.2×10^4, 0.87×10^4 and 0.70×10^4 for HPMCAS, lecithin and zein NPs, respectively.

Table S2. Velocity and kinematic viscosity of each stream for the formulation of HPMCAS NPs

	Organic stream 1	Aqueous stream 2	Aqueous stream 3	Aqueous stream 4
U_i (m/s)	0.16	0.48	0.48	0.48
ν_i (m^2/s)	0.54×10^{-6}	0.89×10^{-6}	0.89×10^{-6}	0.89×10^{-6}

Table S3. Velocity and kinematic viscosity of each stream for the formulation of lecithin NPs

	Organic stream 1	Aqueous stream 2	Aqueous stream 3	Aqueous stream 4
U_i (m/s)	0.12	0.36	0.36	0.36
ν_i (m^2/s)	0.54×10^{-6}	0.89×10^{-6}	0.89×10^{-6}	0.89×10^{-6}

Table S4. Velocity and kinematic viscosity of each stream for the formulation of zein NPs

	Organic stream 1	EtOH/water stream 2	Aqueous stream 3	Aqueous stream 4
U_i (m/s)	0.12	0.12	0.36	0.36
ν_i (m^2/s)	0.4×10^{-6}	2.3×10^{-6}	0.89×10^{-6}	0.89×10^{-6}

Lumefantrine calibration curves in the mobile phase of HPLC at 347 nm

The mobile phase of HPLC is ACN:water (60/40, v/v, both with 0.05 vol% trifluoroacetic acid)

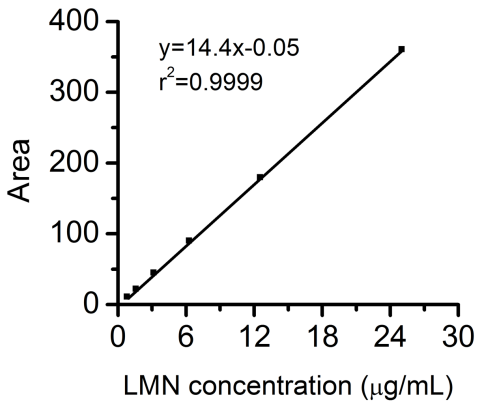

Figure S1. Calibration curve for lumefantrine dissolved in the mobile phase of HPLC at 347 nm

NMR data for HPMCAS NPs

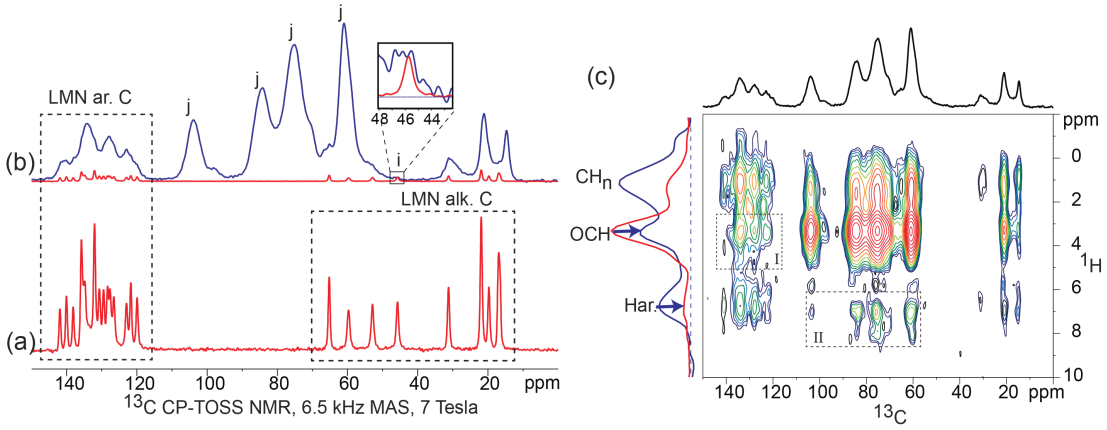

Figure S2. ^{13}C CPMAS solid-state NMR with total suppression of spinning sidebands (TOSS) of (a) bulk LMN (spectrum in red) and (b) HPMCAS NPs (spectrum in blue). The aromatic carbon (ar. C) and alkyl carbon (alk. C) signals of LMN are highlighted by dashed boxes. Peaks labelled "j" in (b) are the signals from the HPMCAS with minimal overlap from the LMN signal. Overlayed on (b) is the bulk LMN spectrum, scaled down to match the signal intensity of the residual crystalline LMN signal in the HPMCAS NPs. Inset in (b) shows the zoomed in fit of the residual crystalline LMN peak labelled "i". (c) 2D ^{13}C-^{1}H HETCOR NMR of HPMCAS NPs acquired with 300 ms of ^{1}H spin diffusion. The 1D ^{13}C of the HPMCAS NPs is plotted along the top for reference. ^{1}H spectra are plotted on the left, with the spectrum in blue and red corresponding to the ^{1}H signal associated with the LMN and HPMCAS respectively. The deashed box labelled "I" represents the correlation signal between the aromatic carbons of the LMN the OCH protons of the HPMCAS. Conversely box labelled "II" represents the correlation signal between the OCH carbons of the HPMCAS and the aromatic protons of the LMN.

References:

1. Liu, Y., et al., *Mixing in a multi-inlet vortex mixer (MIVM) for flash nano-precipitation.* Chemical Engineering Science, 2008. **63**(11): p. 2829-2842.