Supporting Information

Organosilica-based deformable nanopesticides with enhanced insecticidal activity prepared by flash nanoprecipitation

Enguang Ma,[a] Zhinan Fu,[*b] Liang Sun,[a] Kai Chen,[*a] Zhiyong Liu,[a] Zhong Wei,[a] Li Li,[b] and Xuhong Guo[* a, b]

[a]School of Chemistry and Chemical Engineering/State Key Laboratory Incubation Base for Green Processing of Chemical Engineering, Shihezi University, 832000 Xinjiang, P.R. China

[b]State Key Laboratory of Chemical Engineering, East China University of Science and Technology, 200237 Shanghai, P.R. China

[*]To whom correspondence should be addressed. E-mail: fuzhinan@ecust.edu.cn (Z. N. Fu), chenkai@shzu.edu.cn (K. Chen), guoxuhong@ecust.edu.cn (X. H. Guo)

Multilayer model is a commonly used but comprehensive approach for modeling the scattering intensity of silica nanoparticles.[1] The scattering intensity of a HMON can be split into two main contributions as follows.

$$I(q,r) = I_{CS}(q,r) + I_{in}(q) \tag{1}$$

Here, $I_{CS}(q,r)$ is the contribution of the entire cavity-shell structure of the nanoparticle. For spherical symmetric silica nanoparticles with radius R, $I_{CS}(q,r)$ equals to the square of scattering amplitude $B(q)$ which can be calculated by Eq 2.

$$B(q) = 4\pi \int_0^R [\rho^e(r) - \rho_s^e] \frac{\sin(qr)}{qr} r^2 dr \tag{2}$$

Here, $\rho^e(r)$ is the electron density of silica nanoparticle and ρ_s^e is the electron density of solvent. Thus, $\Delta\rho = \rho^e(r) - \rho_s^e$ denotes the excess radial electron density between silica particles and the solvent. The radius of thickness of silica shell is divided into five layers.[2]

The second term $I_{in}(q)$ is originated from the static inhomogeneities which are distributed at random in the silica shell. The calculation of $I_{in}(q)$ is expressed by Eq 3.

$$I_{in}(q) = I_{in}(0) exp(-r_g^2 q^2) \tag{3}$$

Where is $I_{in}(0)$ regarded as an adjustable parameter and r_g represents the radius of gyration of the static inhomogeneities.[3]

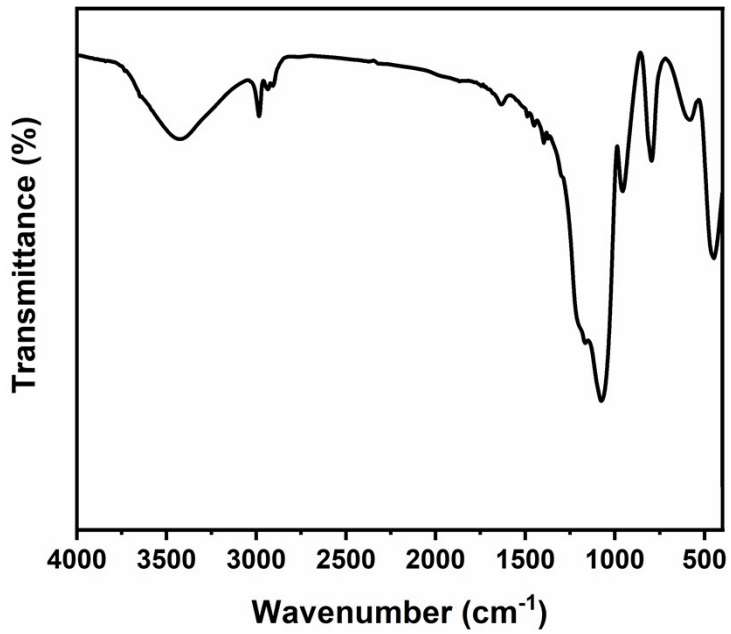

Fig. S1. FTIR spectra of the HMONs.

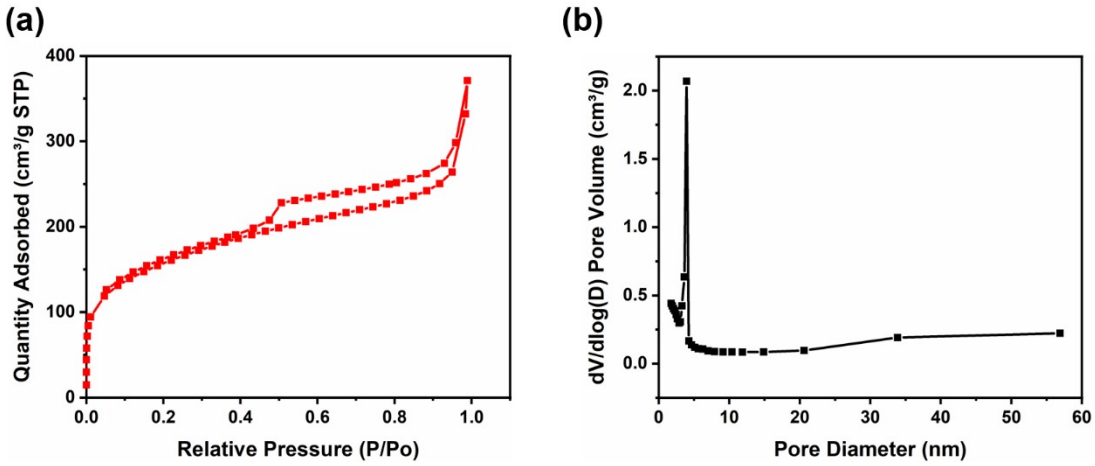

Fig. S2. (a) Nitrogen adsorption/desorption isotherms, (b) mesopore size distribution of the HMONs.

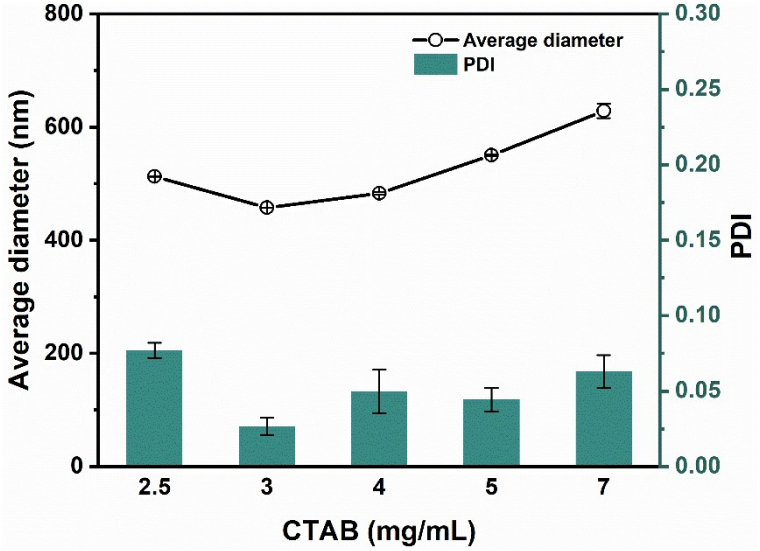

Fig. S3. Effect of CTAB concentration on the average particle size and PDI value of the HMONs.

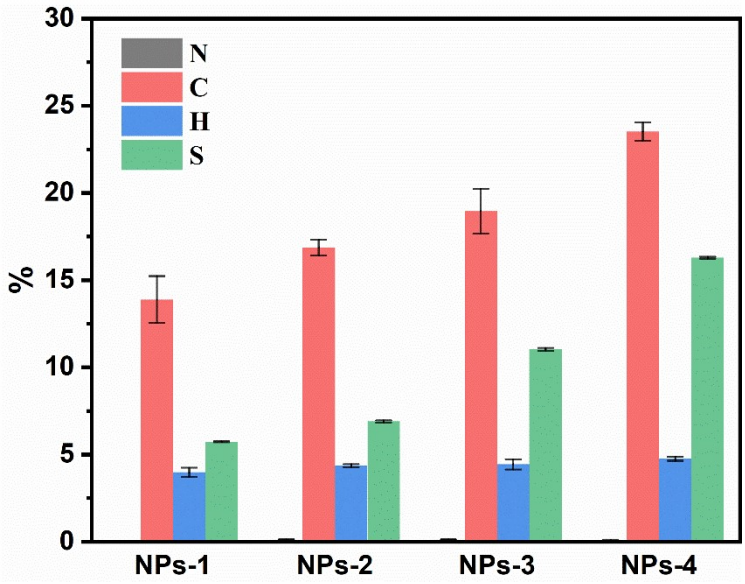

Fig. S4. Analysis of N, C, H, and S elements in four thioether-bridged organosilica nanoparticles.

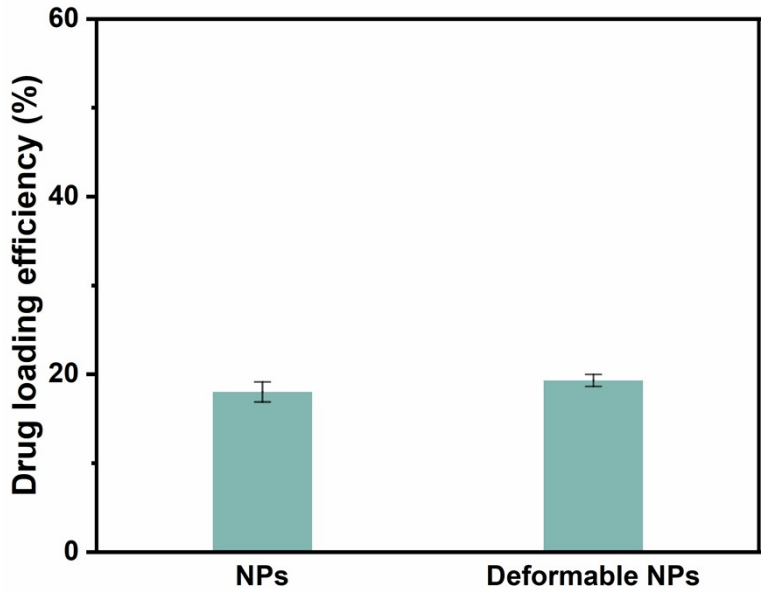

Fig. S5. Drug loading efficiency of different Abm-loaded NPs formulations.

Table S1 Analysis of the elemental content of N, C, H, and S in four thioether-bridged organosilica nanoparticles

Sample	N (%)	C (%)	H (%)	S (%)
NPs-1	0.03±0.03	13.89±1.34	3.99±0.26	5.74±0.03
NPs-2	0.13±0.02	16.88±0.46	4.37±0.08	6.90±0.06
NPs-3	0.12±0.02	18.96±1.29	4.47±0.29	11.04±0.09
NPs-4	0.01±0.04	23.53±0.53	4.77±0.12	16.29±0.06

References

(1) Yang, Q.; Li, L.; Zhao, F.; Han, H.; Wang, W.; Tian, Y.; Wang, Y.; Ye, Z.; Guo, X. *J. Mater. Sci.* 2018, **54**, 2552-2565.

(2) Han, H.; Li, L.; Wang, W.; Tian, Y.; Wang, Y.; Wang, J.; von Klitzing, R.; Guo, X., *Langmuir,* 2017, **33**, 9857-9865.

(3) Dingenouts, N.; Norhausen, C.; Ballauff, M., *Macromolecules,* 1998, **31**, 8912-8917.