# Electronic Supporting Information

## Tailoring the mechanoresponsive release from silica nanocapsules

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## Experimental Section

Table S1: Library of silica nanoparticles prepared.

| Sample No. | TEOS (g) | HD (g) | Hexane (g) | Toluene (g) | Rhodamine -PEG (g) | Diameter* (nm) | *PDI* * | Shell thickness ** (nm) | Surfactant conc. (mg/mL) |
|---|---|---|---|---|---|---|---|---|---|
| 1a | 2 | - | - | 3 | 0.05 | 85 | 0.13 | 5.5±0.6 | 100 |
| 1b | 3 | - | - | 3 | 0.05 | 110 | 0.17 | 7.4±0.7 | 85 |
| 1c | 4 | - | - | 3 | 0.05 | 126 | 0.13 | 8.5±0.8 | 85 |
| 1d | 4 | - | - | 3 | 0.05 | 177 | 0.17 | 8.5±0.8 | 70 |
| 2a | 3 | - | 3 | - | - | 108 | 0.11 | 6.1±0.5 | 85 |
| 2b | 4 | - | 3 | - | - | 109 | 0.14 | 7.0±0.7 | 85 |
| 2c | 4 | - | 3 | - | - | 104 | 0.13 | 7.2±0.7 | 85 |
| 2d | 5 | - | 3 | - | - | 114 | 0.12 | 8.2±0.6 | 85 |
| 3a | 4 | 3 | - | - | - | 75 | 0.12 | 5.7±0.8 | 100 |
| 3b | 4 | 3 | - | - | - | 103 | 0.13 | 5.5±0.6 | 85 |
| 3c | 4 | 3 | - | - | - | 141 | 0.15 | 5.8±0.4 | 70 |
| 3d | 6 | 3 | - | - | - | 110 | 0.13 | 6.3±0.5 | 85 |
| 3e | 8 | 3 | - | - | - | 100 | 0.12 | 7.4±0.7 | 85 |
| 3f | 9 | 3 | - | - | - | 121 | 0.15 | 7.8±0.6 | 85 |
| 3g | 10 | 3 | - | - | - | 110 | 0.14 | 8.5±0.7 | 85 |
| 3h | 10 | 3 | - | - | - | 164 | 0.17 | 8.5±0.8 | 70 |
| 3i | 10 | 3 | - | - | - | 205 | 0.18 | 8.8±0.5 | 60 |

* The size distribution was characterized by DLS with the cumulant analysis, where the diameter (D) is the Z-average diameter, and the polydispersity index (PDI) is given by $PDI=(s/D)^2$, where s is the standard deviation of the cumulant fit.

** The shell thickness was measured from the TEM images with the analysis of N>50 nanocapsules

## Additional results

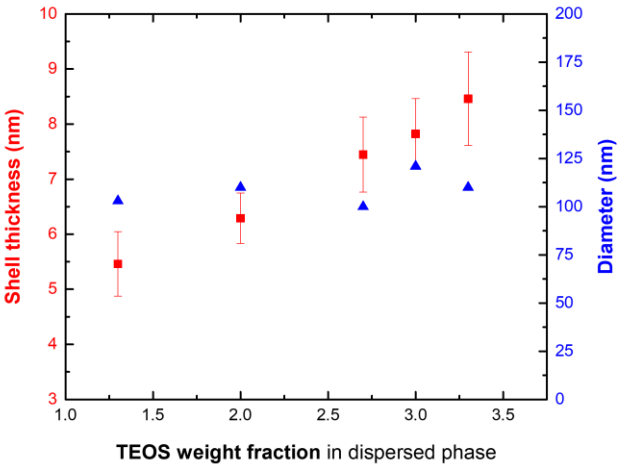


Figure S1: Control of the shell thickness for SiNCs of similar diameter by tuning the weight fraction of TEOS during miniemulsion.

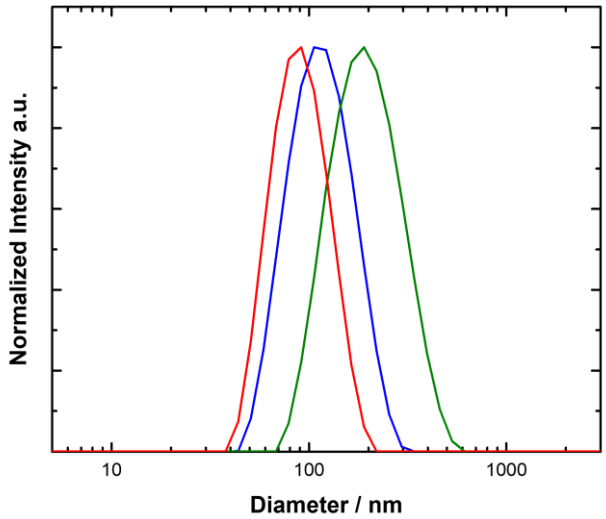


Figure S2: DLS curves of SiNCs with HD core of different sizes. The size of the SiNCs was controlled by varying the recipe, the surfactant concentrations, as indicated in Table S1. The size was also influenced by the pressure applied during microfluidization: high pressure (15000 psi) yielded small SiNCs (D=85 nm, PDI=0.134) (red); medium pressure (5000 psi) yielded medium SiNCs (D=110 nm, PDI=0.170) (blue); low pressure (2000 psi) yielded large SiNCs green (D=177 nm, PDI=0.167) (green). The size distribution was characterized by DLS with the cumulant analysis, where D is the Z-average diameter, and the polydispersity index PDI is given by $PDI=(s/D)^2$, where s is the standard deviation of the cumulant fit. The values are the average of 3 measurements.

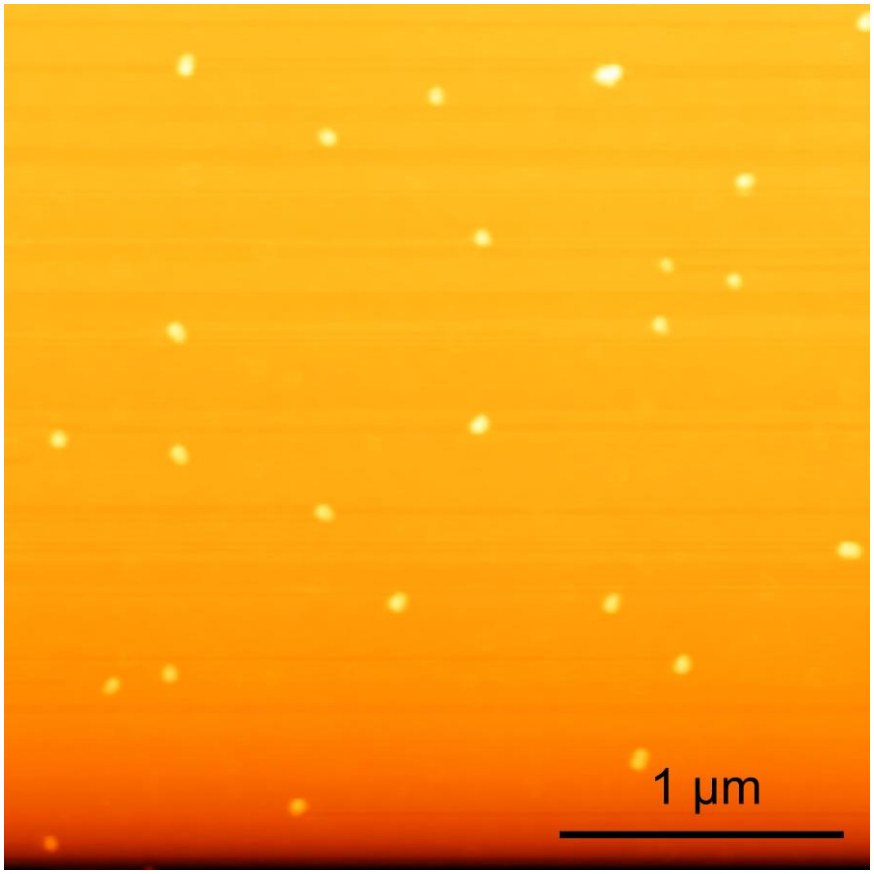


Figure S3: AFM survey scan of SiNCs with HD core and 110 nm average size. After identifying single SiNCs from this scan, a subsequent scan at a higher resolution focusing on one single SiNC was carried out, followed by the actual nanoindentation experiment.

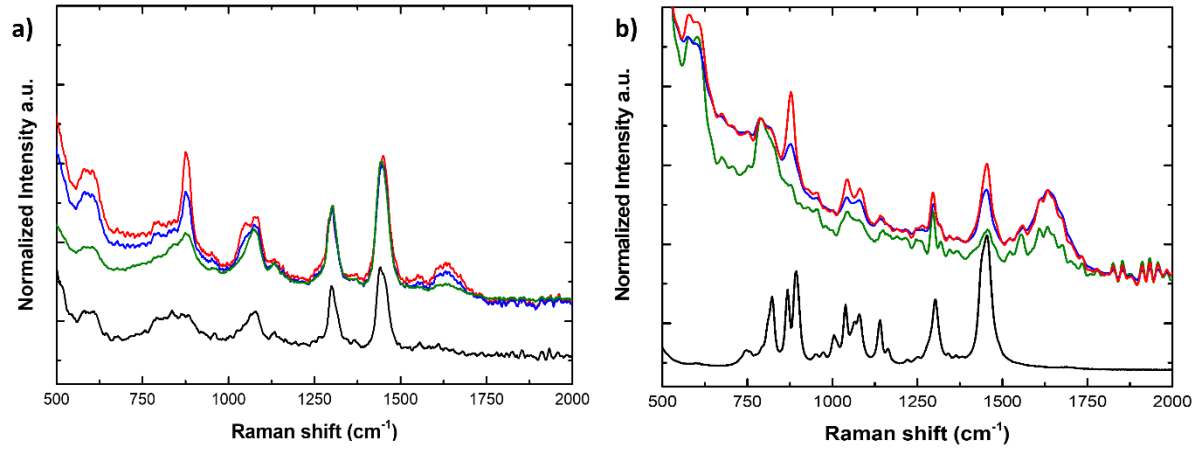


Figure S4: Raman spectra of SiNCs drying from an aqueous suspension. a) Raman spectrum of pure HD (black) and HD core SiNCs at different times during drying (red: 0 min; blue: 60 min; green: 120 min). b) Raman spectrum of pure Hexane (black) and hexane core SiNCs at different times during drying (red: 0 min; blue: 60 min; green: 120 min).

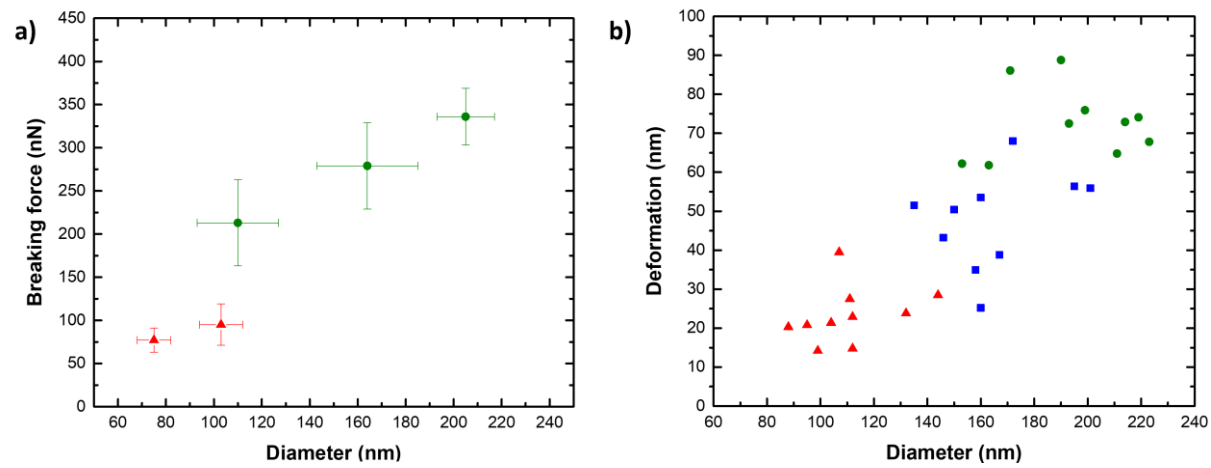


Figure S5: a) Breaking force for SiNCs with shell of 5.5 nm (red triangles) and or 8.5 nm shell SiNCs (green circles) and different diameter. b) Maximal deformation at the breaking point for SiNCs with different diameters (red triangles : small diameter, blue squares : medium diameter, green circles : large diameter) and a shell thickness of 8.5 nm.

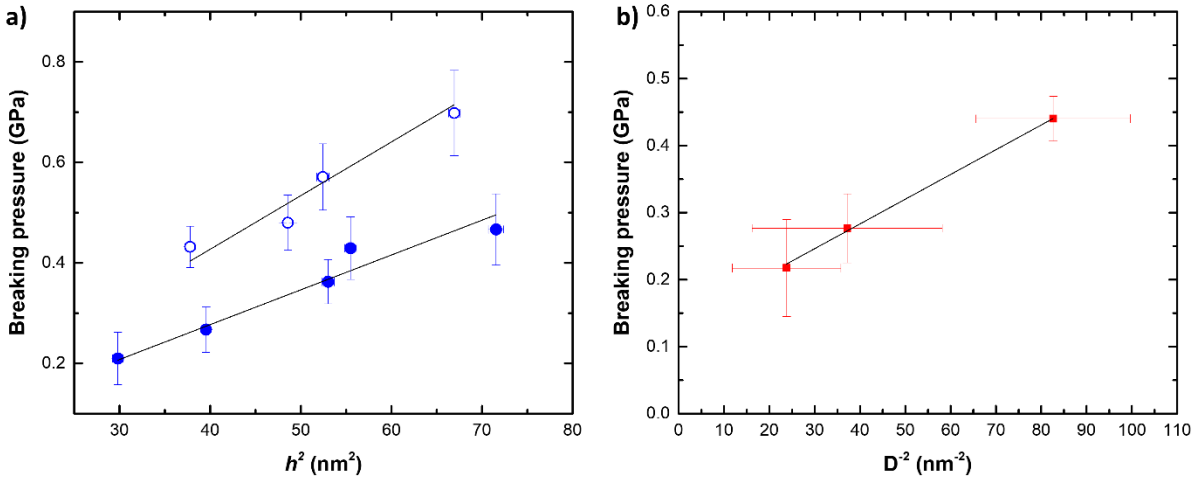


Figure S6: a) Breaking pressure of silica nanocapsules with different shell thickness ($h^2$) for SiNCs of 110 nm diameter containing a liquid core (solid circle) or an empty core (empty circles). b) Breaking pressure of SiNCs with 8.5 nm shell and varying diameter, containing a liquid core plotted versus the diameter $D^{-2}$. The lines are fits to equation 3.

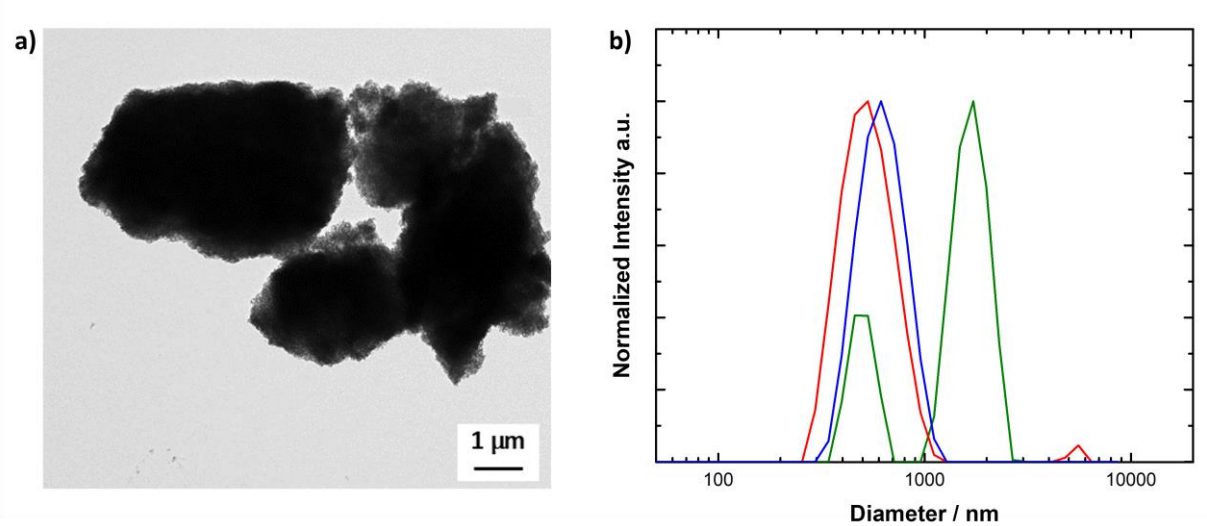


Figure S7: Redispersion of compressed SiNCs. a) TEM image of SiNCs without glucose compressed by 4 t. b) Dynamic light scattering measurement of redispersed SiNCs in EtOH:$H_2O$ (1:1). No compression and no glucose (red), 4 t compression with glucose (blue), 4 t compression without glucose (green).