**Supporting information on**

# Confinement induced alteration of morphologies of oil-water emulsion

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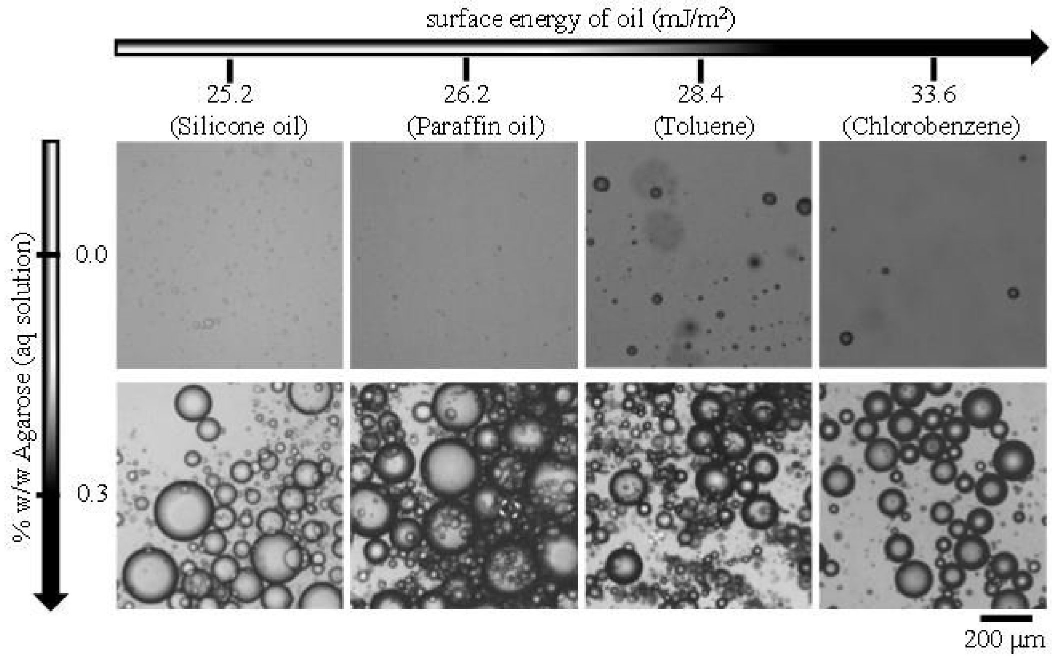



**Figure S1:** Oils of different surface tension are dispersed in DI water in absence and in presence of Agarose.

**Estimation of surface energy of polystyrene and glass cover slip:** Equation 1, when combined with the Young's equation results in the following equation:

$$(1+\cos\theta)\gamma_1 = (1+\cos\theta)(\gamma_1^d + \gamma_1^p) = 2\left[\sqrt{\gamma_1^d \gamma_2^d} + \sqrt{\gamma_1^p \gamma_2^p}\right] \qquad \text{Eq. S1}$$

In order to determine the surface energy of Polystyrene (PS), sessile drops (10 μL) of water and Pentadecane (PD) were placed on this surface and the respective static equilibrium contact angles were measured. For water and PD, these angles were obtained as $\theta_{\text{Water-PS}} = 91.7^o$ and $\theta_{\text{PD-PS}} = 23.6^o$ respectively. The dispersive and polar components of surface tension for water are, $\gamma_{Water}^d = 21.8$ mN/M and $\gamma_{Water}^p = 51$ mN/M, whereas that for PD are $\gamma_{PD}^d = 27.1$ mN/M and $\gamma_{PD}^p = 0$ mN/M respectively. Using these values of surface tension and contact angles in equation 1, one obtains the following set of equations:

$$\left(1+\cos 91.7^0\right)\left(21.8+51.0\right)=2\left[\sqrt{21.8\times\gamma_{PS}^d}+\sqrt{51.0\times\gamma_{PS}^p}\right] \quad \text{Eq. S2}$$

$$\left(1+\cos 23.6^0\right)\left(27.1+0\right)=2\left[\sqrt{27.1\times\gamma_{PS}^d}+\sqrt{0\times\gamma_{PS}^p}\right] \quad \text{Eq. S3}$$

Equations S2 and S3 are solved simultaneously to determine surface tension of polystyrene as, $\gamma_{\mathrm{PS}}=27.7$ mN/m ( $\gamma_{\mathrm{PS}}^d=24.9$ mN/m, $\gamma_{\mathrm{PS}}^p=2.83$ mN/m).

Similarly, for the determination of surface tension of Glass Cover Slip (CS), drops of water and Nitromethane (NM) ( $\gamma_{NM}^d=22$ mN/M and $\gamma_{NM}^p=14.5$ mN/M) were placed on this surface and the respective contact angles were measured as, $\theta_{\text{Water-Glass}}=47.7^o$ and $\theta_{\text{NM-Glass}}=38.3^o$ respectively which resulted in the following equations:

$$\left(1+\cos 47.7^0\right)\left(21.8+51.0\right)=2\left[\sqrt{21.8\times\gamma_{CS}^d}+\sqrt{51.0\times\gamma_{CS}^p}\right] \quad \text{Eq. S4}$$

$$\left(1+\cos 38.3^0\right)\left(22.0+14.5\right)=2\left[\sqrt{22.0\times\gamma_{CS}^d}+\sqrt{14.5\times\gamma_{CS}^p}\right] \quad \text{Eq. S5}$$

Simultaneous solution of equations S4 and S5 give surface tension of Glass Cover Slip as $\gamma_{\mathrm{CS}}=72.13$ mN/m ( $\gamma_{\mathrm{CS}}^d=0.003$ mN/m, $\gamma_{\mathrm{CS}}^p=72.13$ mN/m).

**Estimation of surface tension of aq-Agarose solution:** Using the PS and CS surfaces, it was possible to obtain the surface tension of other liquids e.g. aqueous solution of aq-Agarose (0.01% w/w Agarose in water). A 10 µl sessile drop of aq-Agarose (pH = 7), was found to form contact angles: $\theta_{\text{Ag-PS}}=87.42^o$ , $\theta_{\text{Ag-CS}}=49.2^o$ on PS and CS surfaces respectively, using which the surface tension of aq-Agarose was calculated as $\gamma_{Ag}=68.57$ mJ/m$^2$.

## Estimation of surface and interfacial tension of different liquids:

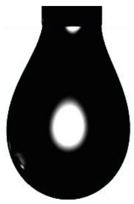
| Pair of liquids | Aqueous solution of Agarose (0.1%) | Paraffin oil | Silicone oil | Paraffin oil & Agarose solution | Silicone oil & Agarose solution | Paraffin oil & Silicone oil |
|---|---|---|---|---|---|---|
| Image |  |  |  |  |  |  |
| Drop phase | Aqueous solution of Agarose (0.1%) | Paraffin oil | Silicone oil | Aqueous solution of Agarose (0.1%) | Aqueous solution of Agarose (0.1%) | Silicone oil |
| Drop volume (μL) | 28.8 | 9.1 | 7.4 | 74.7 | 176.9 | 0.9 |
| Ambient | Air | Air | Air | Paraffin oil | Silicone oil | Paraffin oil |
| γ(mN/m) (Pendant drop method) | 63.8±0.23 | 25.5±0.96 | 24.6±0.70 | 39.6±0.90 | 29.7±0.79 | 0.72±0.083 |
| γ(mN/m) (Owens and Wendt equation) | 63.0 | 25.5 | 24.3 | 39.7 | 29.7 | 0.78 |

**Table S1.** Surface and interfacial tension of different liquids estimated experimentally using pendant drop method (data presented in last but one row) and by using Owens and Wendt equation (last row).

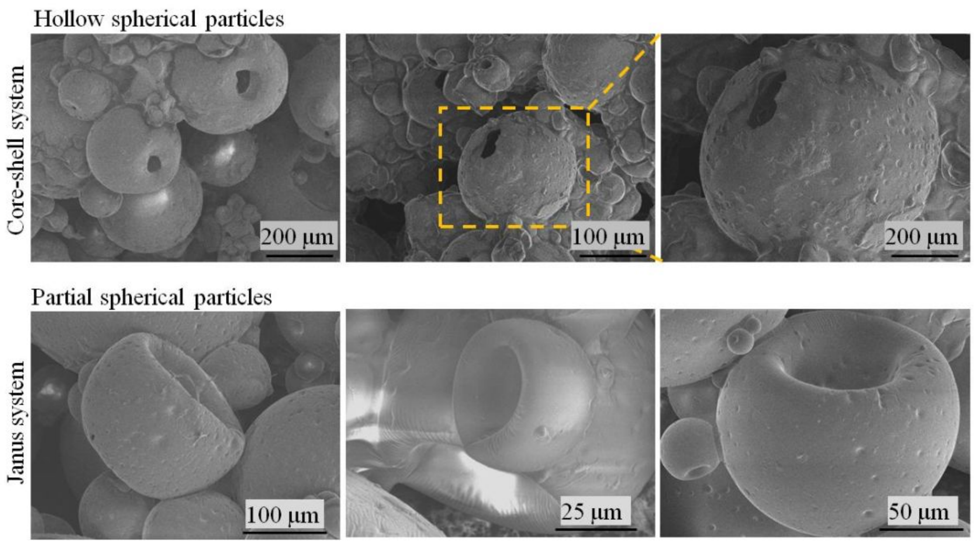



**Figure S2.** SEM images of PDMS particles generated from core-shell and Janus morphology.

Figure S2 shows the detail view of SEM images of particles generated from Core-shell and Janus morphology. In each case, particles of all diameter were of the similar type. The images did not show occurrence of even a single solid sphere. Even the very small particles, as highlighted by a dashed square in the image, are not complete sphere.

## Estimation of surface tension of aq-SDS (1 mM) and aq-CTAB (0.01 mM) solution:

| Solid surface used | **SDS (1 mM)** | **CTAB (0.01 mM)** |
|---|---|---|
| cover slip<br>( $\gamma_{CS}$ = 72.13 mN/m) |  |  |
| Polystyrene<br>( $\gamma_{PS}$ = 27.7 mN/m |  |  |
| Contact angle | $\theta_{SDS-CS} = 39.7^0$ | $\theta_{CTAB-CS} = 38.8^0$ |
| | $\theta_{SDS-PS} = 85.3^0$ | $\theta_{CTAB-PS} = 85.9^0$ |
| Surface tension<br>(calculated using equation 2) | $\gamma_{SDS} = 61.88$ mN/m<br>( $\gamma^d_{SDS} = 20.68$ mN/m,<br>$\gamma^p_{SDS} = 41.19$ mN/m) | $\gamma_{CTAB} = 62.11$ mN/m<br>( $\gamma^d_{CTAB} = 20.16$ mN/m,<br>$\gamma^p_{CTAB} = 41.94$ mN/m) |
| Interfacial tension<br>(calculated using equation 1) | $\gamma_{Si-SDS} = 30.42$ mN/m | $\gamma_{Si-CTAB} = 31.09$ mN/m |
| | $\gamma_{Par-SDS} = 40.74$ mN/m | $\gamma_{Par-CTAB} = 41.54$ mN/m |
| Difference in interfacial tension | $\gamma_{Par-SDS} - \gamma_{Si-SDS} =$<br>10.32 mN/m | $\gamma_{Par-SDS} - \gamma_{Si-SDS} =$<br>10.45 mN/m |

**Table S2.** Estimation of surface tension of aq-SDS (1 mM) and aq-CTAB (0.01 mM) solution.