**Micro-structural investigations on oppositely charged mixed surfactant gels with potential dermal applications**

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phase_mal.TIFphase_asp.TIF

phase_glu.TIF

**Fig. S1.** Variation in relative area of precipitate, viscous, and gel phase of (a), C12MalNa2+HTAB; (b), C12AspNa2+HTAB and (c), C12GluNa2+HTAB mixture at different surfactant concentrations. Temperature: 25°C.

**POM.tif**

**Fig. S2.** POM images of C12MalNa2 + HTAB mixtures at different compositions. (C12MalNa2+ HTAB) concentration (wt %): a1, a2, a3, a4, and a5: 1, 2, 3, 4, 5; C12MalNa2: HTAB (*w*/*w*): a1, b1, c1, d1, and e1: 80/20, 60/40, 50/50, 40/60, and 20/80 *w*/*w*. Scale bars in (µm) are shown inside the images.

S3.tif

**Fig. S3.** POM images of (C12AspNa2+ HTAB; a1, b1, and c1) and (C12GluNa2+ HTAB; a2, b2, and c2) at 5 wt% of total surfactant concentration and at different (50/50, 60/40, and 80/20) weight ratio of AAS/HTAB. Scale bars in (µm) are shown inside the figure.

Fig. S4.tif

**Fig. S4.** FE-SEM images of C12MalNa2+HTAB at different concentration (wt%): a1, a2, a3, a4, and a5: 1, 2, 3, 4 and 5 at the different C12MalNa2/HTAB ratio (*w*/*w*): a1, b1, c1, d1, and e1: 80/20, 60/40, 50/50, 40/60, and 20/80*w*/*w*. Scale bars in (µm) are shown inside the images.

**S5.tif**

**Fig. S5.** FE-SEM images of C12AspNa2+HTAB (a1, b1, and c1) and C12GluNa2+HTAB (a2, b2, and c2) at 5 wt% of total surfactant concentration and at different (50/50, 60/40, and 80/20) weight ratio of AAS/HTAB. Scale bars in (µm) are shown inside the figure.

**Table S1A.** Summarized results on the POM (Corresponding to Figure S2) and FE-SEM (Corresponding to Figure S4) studies at different wt% of C12MalNa2+HTAB aggregates.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **(C12MalNa2+HTAB wt%)** | **C12MalNa2/ HTAB (*w*/*w*)** | | | | |
| 80/20 | 60/40 | 50/50 | 40/60 | 20/80 |
| (a) | (b) | (c) | (d) | (e) |
| **Type of the texture/ liquid crystal** | | | | | |
| 1 | nematic | smectic | columnar | rod | disk |
| 2 | calamitic | nematic | smectic | columnar | flower |
| 3 | nematic | spherulite | cholesteric | flower | flower |
| 4 | smectic | discotic | smectic | flower | flower |
| 5 | spherulite | flower | calamitic | flower | flower |
|  | **SEM (morphology)** | | | | |
| 1 | coral | leaf | flake | leaf | flower |
| 2 | leaf | leaf+flake | irregular structure | coral | granular |
| 3 | porous | flake | fibrous network | sheet-like structure | cuboid |
| 4 | amorphous | flower | flake | amorphous | granular |
| 5 | wrinkled | flower | flower | dense fibrous | flower |

**Table S1B.** Summarized results on the POM (Corresponding to Figure S3) and FE-SEM (Corresponding to Figure S5) images at 5 wt% of total surfactant concentration and at different wt. ratio of C12AspNa2+HTAB and C12GluNa2+HTAB aggregates.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| System |  | **AAS/HTAB (*w*/*w*)** | | |
|  | 50/50 | 40/60 | 20/80 |
|  |  | (a) | (b) | (c) |
|  |  | **Type of the texture/ liquid crystal** | | |
| (C12AspNa2 + HTAB) | 1 | smectic | spherulite | flower |
| (C12GluNa2 + HTAB) | 2 | discotic | calamitic | flower |
|  |  | **SEM (morphology)** | | |
| (C12AspNa2 + HTAB) | 1 | fibrous | dense fibrous | densely-packed cuboid |
| (C12GluNa2 + HTAB) | 2 | cuboid | irregular structure | sheet-like structure |

S-6.TIF

**Fig. S6.** TGA of AASs and HTAB. Systems: 1, C12MalNa2; 2, C12AspNa2; 3, C12GluNa2 and 4, HTAB where a1, b1, c1, d1, a2, b2, c2, a3, b3, c3, a4, b4 and c4 represent the different phase transitions. Scan rate: 2°C min-1.

**Table S2.** Summarized results on the TGA of AAS, HTAB and their mixtures.

|  |  |  |
| --- | --- | --- |
| **Surfactants** | **Temperature range/°C** | **%wt. remaining** |
| C12MalNa2 | 80-105 | 89 |
| 105-186 | 79 |
| 247-310 | 68 |
| 351-412 | 25 |
| C12AspNa2 | 86-125 | 93 |
| 260-310 | 77 |
| 310-345 | 51 |
| C12GluNa2 | 73-123 | 96 |
| 330-406 | 82 |
| 422-508 | 55 |
| HTAB | 51-120 | 94 |
| 113-158 | 81 |
| 185-263 | 77 |
| 294-360 | 41 |
| C12MalNa2+HTAB\* | 43-102 | 67 |
| 232-259 | 27 |
| C12AspNa2+HTAB\* | 69-120 | 66 |
| 268-300 | 18 |
| C12GluNa2+HTAB\* | 43-109 | 81 |
| 119-288 | 63 |

\*AAS+HTAB=100 mM; AAS: HTAB= 40:60, M/M