Electronic supplementary information

HOLLOW SILICA PARTICLES FROM SILICA SOL

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Experimental section

The microscopic analysis of the samples was performed on a scanning electron microscope (SEM) with a NVision 40 thermal emission source (Carl Zeiss, Germany) and on a JEOL JEM-2100F transmission electron microscope (TEM). The particle sizes were determined by dynamic light scattering using a Zetatrac dynamic light scattering spectrometer (Microtrac, USA).

Silica sol was synthesized according to the published method [S1, S2].

Synthesis of hollow particles. D4 was mixed with water (water/D4 ratio = 175:1 parts by weight), the pH value of which was adjusted with acetic acid and an aqueous solution of ammonia. This mixture was emulsified at 10000 rpm for 5 min using a mechanical disperser (IKA ULTRA-TURRAX T 50). Then, upon continuous emulsification, a 3.5% silica sol in THF was added to the emulsion (silica sol/D4 ratio = 1:1 and 1.5:1 parts by weight). Immediately after this, the resulting mixture was centrifuged at 11000 rpm for 30 min, rinsed three times with water, and dried under vacuum at room temperature.

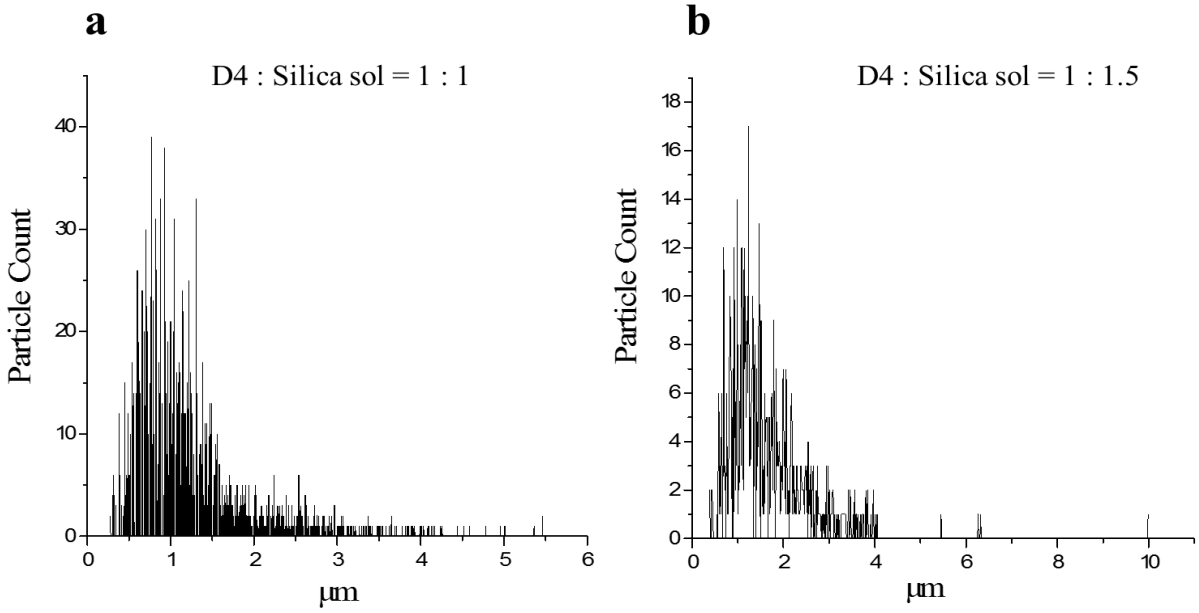

Figure S1. Size distribution of the particles at the D4/silica sol ratio of 1:1 (***a***) and 1:1.5 (***b***) obtained from the neutral D4 emulsion based on the analysis of their micrographs.

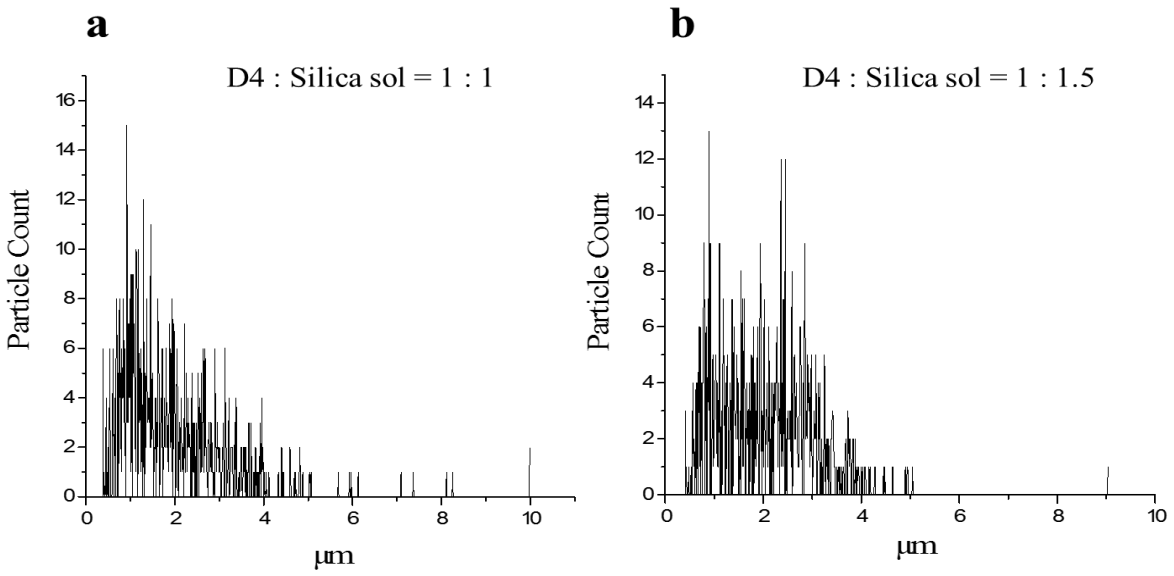

Figure S2. Size distribution of the particles at the D4/silica sol ratio of 1:1 (***a***) and 1:1.5 (***b***) obtained from the acidic D4 emulsion based on the analysis of their micrographs.

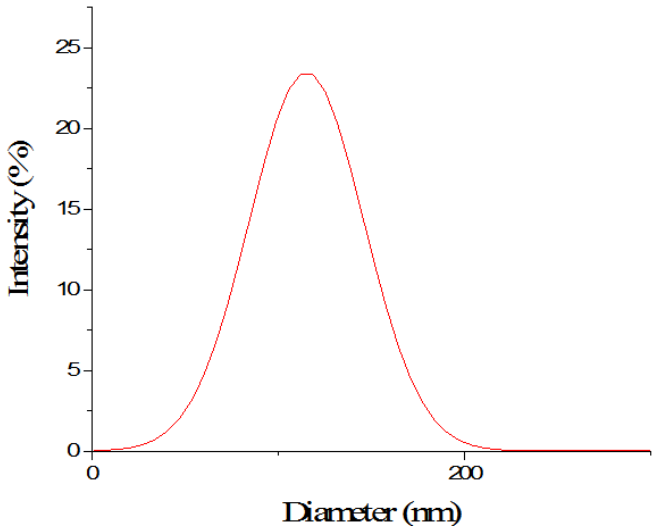

Figure S3. Results of the dynamic light scattering studies of the particles obtained from the basic D4 emulsion at the D4/silica sol ratio of 1:1.

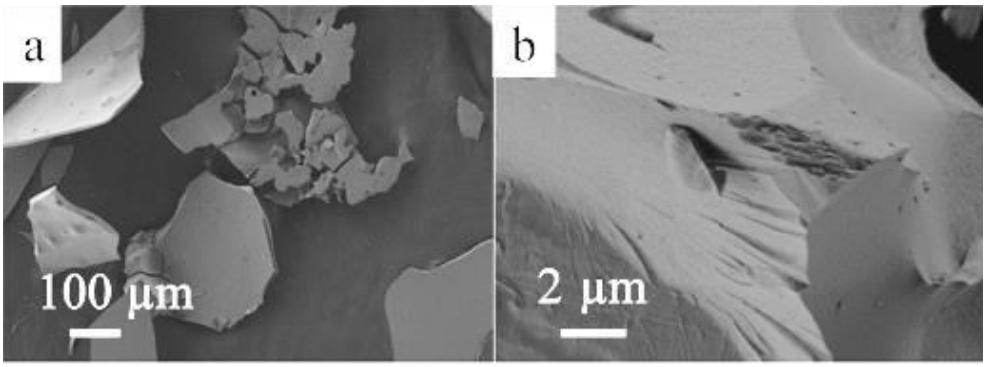

Figure S4. Silicon dioxide agglomerates.

Table S1. General characteristics of the resulting particles

Sample	D4/silica sol ratio	pH of the D4 aq. emulsion	pH of the system after the addition of silica sol	Bulk density, g/cm^3	ζ, mV	Particle sizes, μm	SD, μm	Yield of the hollow particles, %
1	1:1	4	3.4	0.82	–15	1.64	1.15	35–40
2	1:1.5	4	3.4	0.65	–12	1.49	1.03	35–40
3	1:1	7	4.5	0.91	–12	1.3	0.73	35–40
4	1:1.5	7	4.5	0.88	–13	1.46	0.85	35–40
5	1:1	10.4	9.1	0.37	–14	0.115	0.03	2–10
6	1:1.5	10.4	9.1	0.39	–14	0.11	0.042	2–10

References

S1. V. V. Kazakova, E. A. Rebrov, V. B. Myakushev, T. V. Strelkova, A. N. Ozerin, L. A. Ozerina, T. B. Chenskaya, S. S. Sheiko, E. Yu. Sharipov, A. M. Muzafarov, *ACS Symp. Ser.*, **2000**, *729*, 503–515. DOI: 10.1021/bk-2000-0729.ch034

S2. I. B. Meshkov, A. A. Kalinina, V. V. Kazakova, A. I. Demchenko, *INEOS OPEN*, **2020**, *3*, 118–132. DOI: 10.32931/io2022r