

Supplementary information

From colloidal CdSe quantum dots to microscale optically anisotropic supercrystals through bottom-up self-assembly

Authors: Elena V. Ushakova^{1*}, Sergei A. Cherevko¹, Dominika-Olga A. Volgina¹, Viktor V. Zakharov¹, Filipp E. Komissarenko¹, Alexey A. Shcherbakov², Benjamin T. Hogan³, Anna Baldycheva³, Anatoly V. Fedorov¹, Igor R. Nabiev^{4,5} and Alexander V. Baranov¹

* Corresponding author: elena.ushakova@corp.ifmo.ru

¹ ITMO University, Saint Petersburg, 197101 Russia;

² Moscow Institute of Physics and Technology, Dolgoprudny, 141701 Russia

³ University of Exeter, Exeter, United Kingdom

⁴ Laboratoire de Recherche en Nanosciences, LRN-EA4682, Université de Reims
Champagne-Ardenne, 51100 Reims, France

⁵ National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31
Kashirskoye Shosse, 115409 Moscow, Russia

Table S1. Sizes and optical properties of QD samples in solution

QD sample	Size, nm	Size distribution, %	ABS peak position, nm	PL peak position, nm	PL FWHM, nm
1	2.1	10	464	490	30
2	3.1	5	553	565	30
3	4.0	5	584	605	30

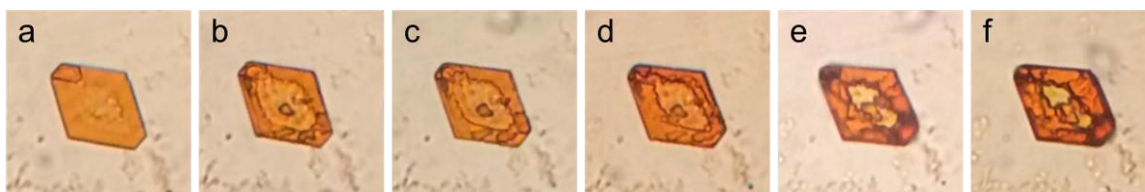


Figure S1. Microphotographs of the SC_{4.0} sample of supercrystals obtained after 5 (a), 8 (b), 9 (c), 12 (d), 25 (e) and 31 (f) days respectively after sample preparation. Image size $\approx 20 \times 20$ μm .

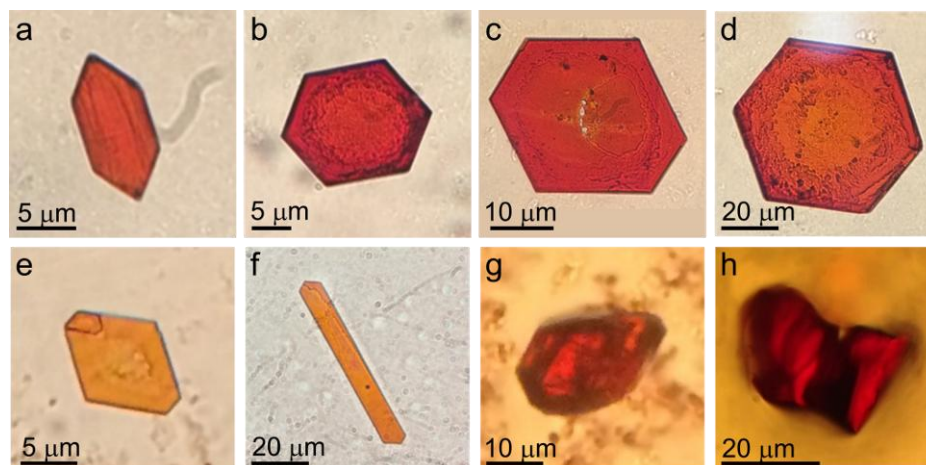


Figure S2. Optical images in white light of supercrystals formed by QDs with diameters of 3.1 nm(a–d) and 4.0 nm (e–h).

Table S2. Supercrystal morphology calculated by Bragg's law from SAXS pattern ($\lambda = 0.154$ nm)

No. SAXS peak	1	2	3	4
θ , deg	1.9	3.8	7.7	11.5
d , nm	4.65	2.32	1.15	0.77
$d = \lambda / \sin \theta$				
a , nm	4.65	4.64	4.6	4.62
$a : d$				
Average distance between QD layers, nm: 4.63 ± 0.03				

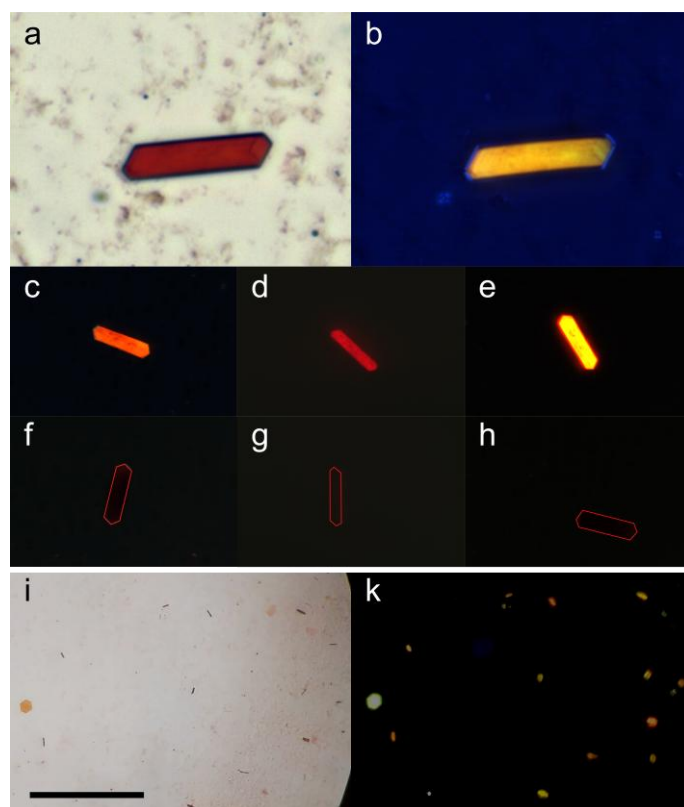


Figure S3. Microphotographs of different supercrystals recorded between parallel polarizers in transmitted (a) and reflected (b) white light, or between crossed polarizers in transmitted (c, d, f, g) and reflected (b, e, h) white light. Photos were obtained with the following objectives: $63\times$ with $NA = 0.75$ (a, c, d, f, g) and $50\times$ with $NA = 0.95$ (b, e, h).

Panel i, k: Microphotographs of $SC_{4.0}$ between parallel (i) and crossed (k) polarizers with minimal apertures to obtain a parallel light propagation in the setup. Scale bar is $500\ \mu\text{m}$.

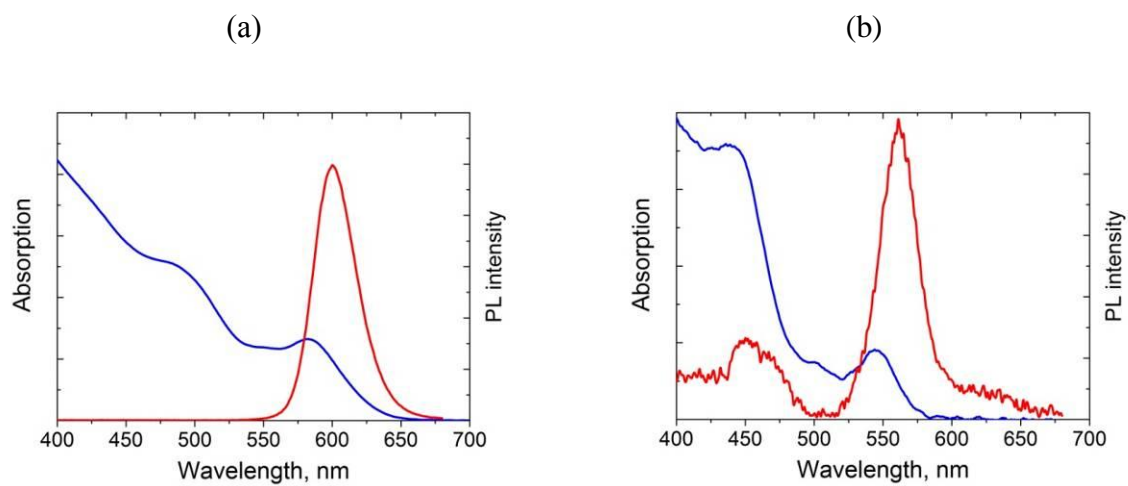


Figure S4. The absorption (blue) and PL (red) spectra of colloidal solutions of CdSe QDs with diameter of 4.0 nm (a) and a mixture of QDs with diameters of 2.1 nm and 3.1 nm (b).