Supplementary Information

Supramolecular Assembly of Biohybrid Photoconversion Systems

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The stability of LHCII in PEO-PPO-PEO solutions

Table S1. Molecular formulas and concentrations of PEO-PPO-PEO polymers used for LHCII stability study.

Pluronic®	Mol. formula	Concentration (w/v)
F38 [1*]	$PEO_{43}PPO_{16}PEO_{43}$	3.4
L35 [2]	$PEO_{11}PPO_{16}PEO_{11}$	1.4
L62 [3]	$PEO_{6}PPO_{34}PEO_{6}$	1.8
P65 [2]	$PEO_{19}PPO_{30}PEO_{19}$	2.4
P84 [4]	$PEO_{19}PPO_{39}PEO_{19}$	3.0
P85 [1]	$PEO_{26}PPO_{40}PEO_{26}$	3.3
P103 [1]	$PEO_{17}PPO_{60}PEO_{17}$	3.5
P105 [1]	$PEO_{37}PPO_{56}PEO_{37}$	4.6
P123 [5]	$PEO_{20}PPO_{70}PEO_{20}$	4.1

The mol ratio of block copolymer to LHCII (0.09 mg protein/ml; 0.03 mg Chl/ml) was 9,000 in 10mM Tris HCl pH 7.7 and 0.015% (m/v) dodecyl maltoside.
* cited literature references for Pluronic® molecular formulas.

References

1. Meilleur et al. *Langmuir* 1996, *12,* 4697-4703.
2. Chang et al. Journal of Colloid and Interface Science Volume 322, Issue 1, 1 June 2008, Pages 263-273.
3. Caragheorgheopol et al. *Macromolecules* 1998, *31,* 7736-7745.
4. Jain et al. *Physicochemical and Engineering Aspects* 2000, *173*, 85-94.
5. Peidong Yang et al. *Science* 1998, *282*, 2244.

Spectrophotometric analysis of LHCII in F38 solution

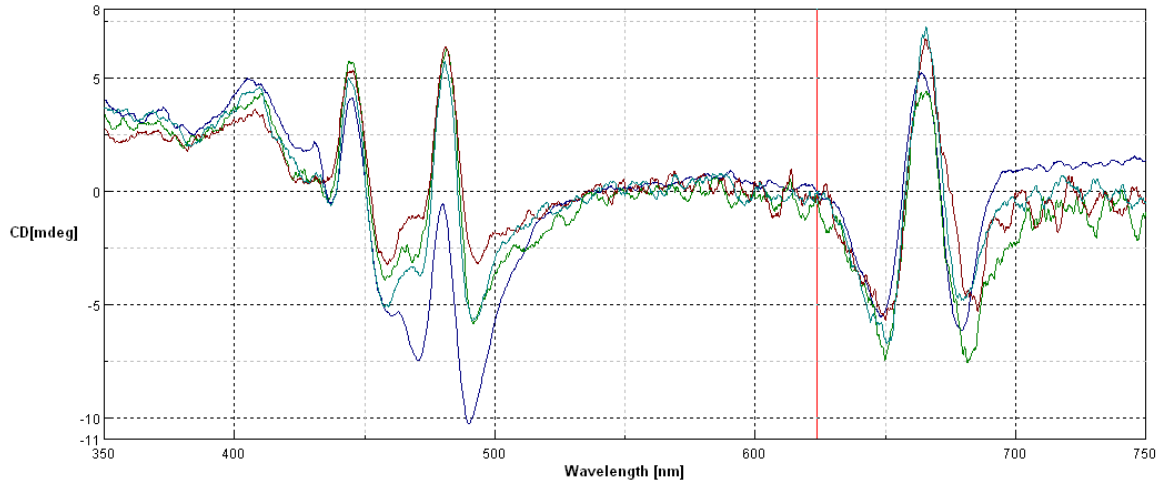

Figure S1. The effect of F38 on the circular dichroism spectrum of LHCII solubilized in DM detergent. The concentration of LHCII was 1.42 mg/ml (0.46 mg Chl/ml) in 0.23% (w/v) DM. The protein: detergent: F38 (PEO_{43}-PPO_{16}-PEO_{43}) mol ratio was 1: 375: 2,667 – 4,417, depending on the final concentration of block copolymer. Spectra with protein to block copolymer ratios of, 0 (dark blue); 1:2,667 (green); 1:3,550 (red) and; 1: 4,417 (light blue) are shown.

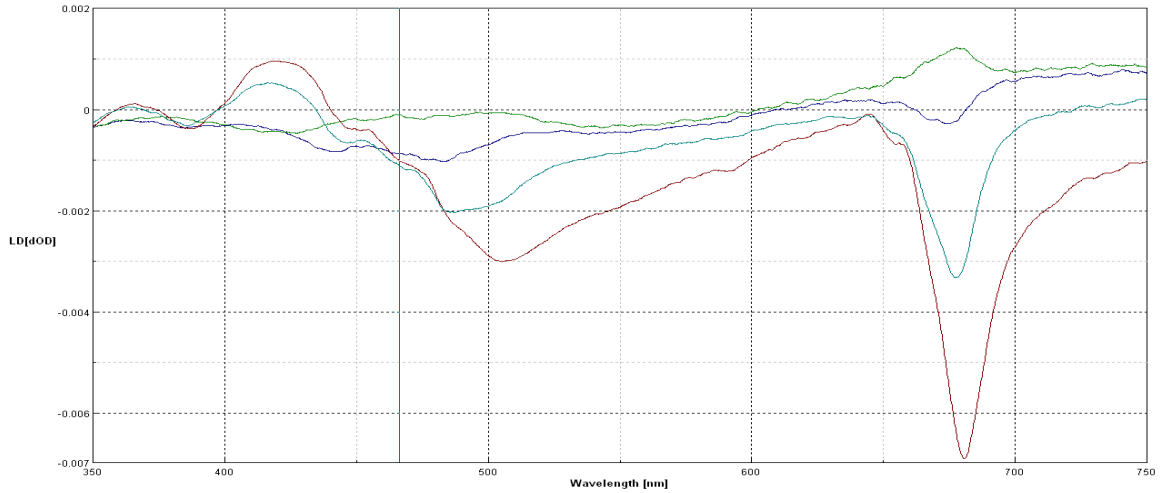

Figure S2. The effect of F38 on the linear dichroism spectrum of LHCII solubilized in DM detergent. The concentration of LHCII was 1.42 mg/ml (0.46 mg Chl/ml) in 0.23% (w/v) DM. The protein: detergent: F38 (PEO_{43}-PPO_{16}-PEO_{43}) mol ratio was 1: 375: 2,667 – 4,417, depending on the final concentration of block copolymer. Spectra with protein to block copolymer ratios of, 0 (dark blue); 1:2,667 (green); 1:3,550 (red) and; 1: 4,417 (light blue) are shown.

Small-angle X-ray scattering (SAXS) analysis

SAXS measurements were performed on the 5-ID beamline at the Advanced Photon Source (APS-Argonne). The incident X-ray monochromatic beam (λ=0.729 Å) was detected on a marCCD 165 detector (4x4 binning) placed 5084 mm away from the sample, covering a scattering vector *q* ranging from 0.08 to 0.25 $Å^{-1}$. Polymer samples were flowed through a capillary tube while the collimated X-ray beam was passed horizontally through a chamber containing the sample. The measurements were performed at room temperature and each SAXS pattern was collected for 10 seconds. Five frames were recorded for each sample in order to check any polymer degradation. No evidence of polymer degradation was observed within 5 frames. Silver behenate powder was used as standard to calibrate the sample-to-detector distance, the detector tilt and the direct beam position. Transmission, dark current and capillary corrections were performed on the 2D image before further data processing. The isotropic scattering patterns were radially averaged. Finally, the scattering pattern obtained from the polymer was subtracted from the scattering pattern of water.

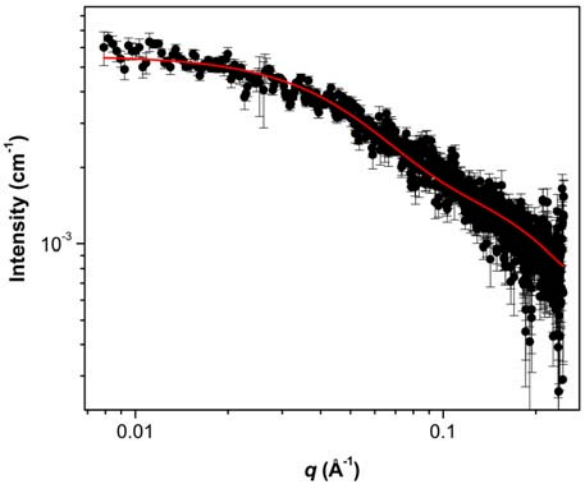

Figure S3. Small-angle X-ray scattering (SAXS) profile of F38 micelles.
The SAXS profile of 0.4% (w/w) F38 solution in H_2O is presented with its corresponding fit assuming a spherical micelle of dense PPO spherical core with Gaussian PEO chains attached to the core.

Small-angle neutron scattering analysis of LHCII in F38 solutions

Experimental details and data interpretation are provided in the manuscript

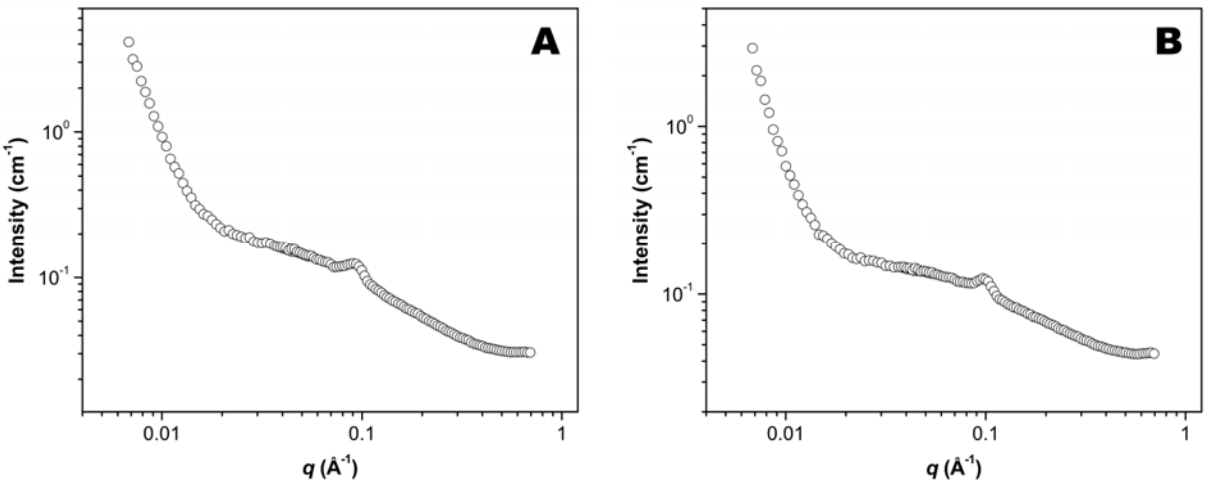

Figure S4. SANS analysis of the interaction of LHCII with F38.
The SANS profiles of LHCII/DM at a protein to block copolymer ratio of (A) 2,667 (15% (w/w) F38) and (B) 4,417 (25% (w/w) F38) are shown. The final concentration of LHCII was 1.42 mg/ml (0.46 mg Chl/ml) and 0.23% (w/v) DM in buffered D_2O solution.