Electronic Supplementary Material (ESI) for Nanoscale Advances.

Engineered protein-based functional nanopatterned materials for bio-optical devices

Daniel Sanchez-deAlcazar, David Romera, Jose Castro-Smirnov, Ahmad Sousaraei, Santiago Casado, Anna Espasa, María C. Morant-Miñana, Jaime J. Hernandez, Isabel Rodríguez, Rubén D. Costa, Juan Cabanillas-Gonzalez, Ramses V. Martinez, and Aitziber L. Cortajarena.*

Supporting Figures and Tables

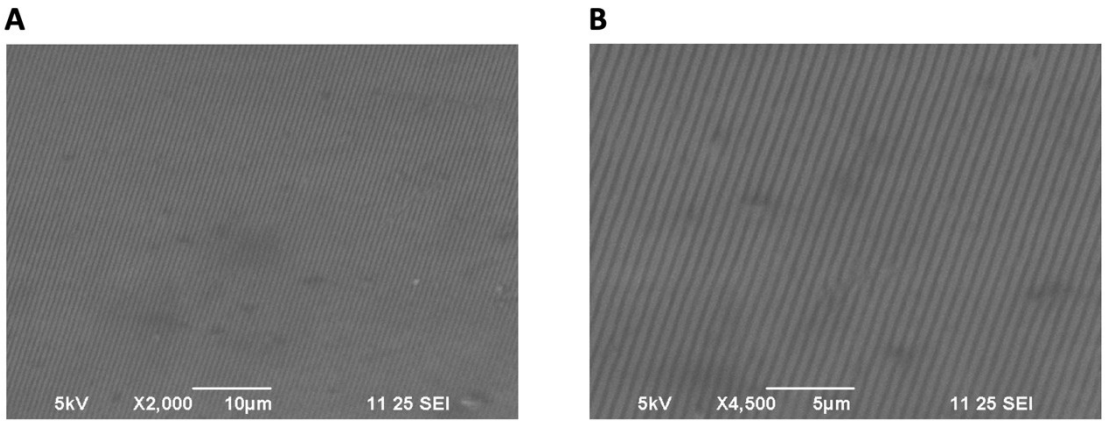

Figure S1. SEM images of CTPR nanostructured film 6 months after manufacturing, stored at room temperature and ambient humidity at two different magnifications.

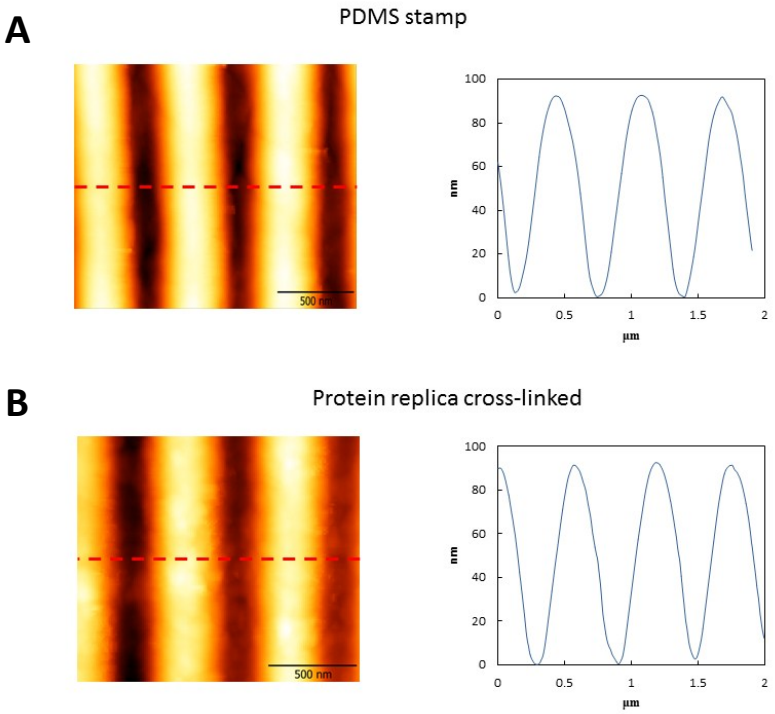

Figure S2. AFM image of PDMS stamp (A) and CTPR nanostructured film replica upon cross-linking reaction and water immersion (B) showing 2 μm^2 x 2 μm^2 area and z-axis profile.

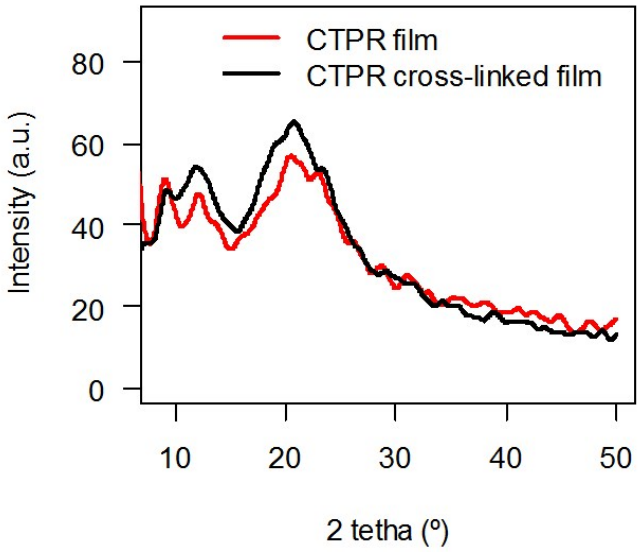

Figure S3. X-ray diffraction spectra of CTPR nanostructured film and CTPR nanostructured cross-linked film under moisture conditions.

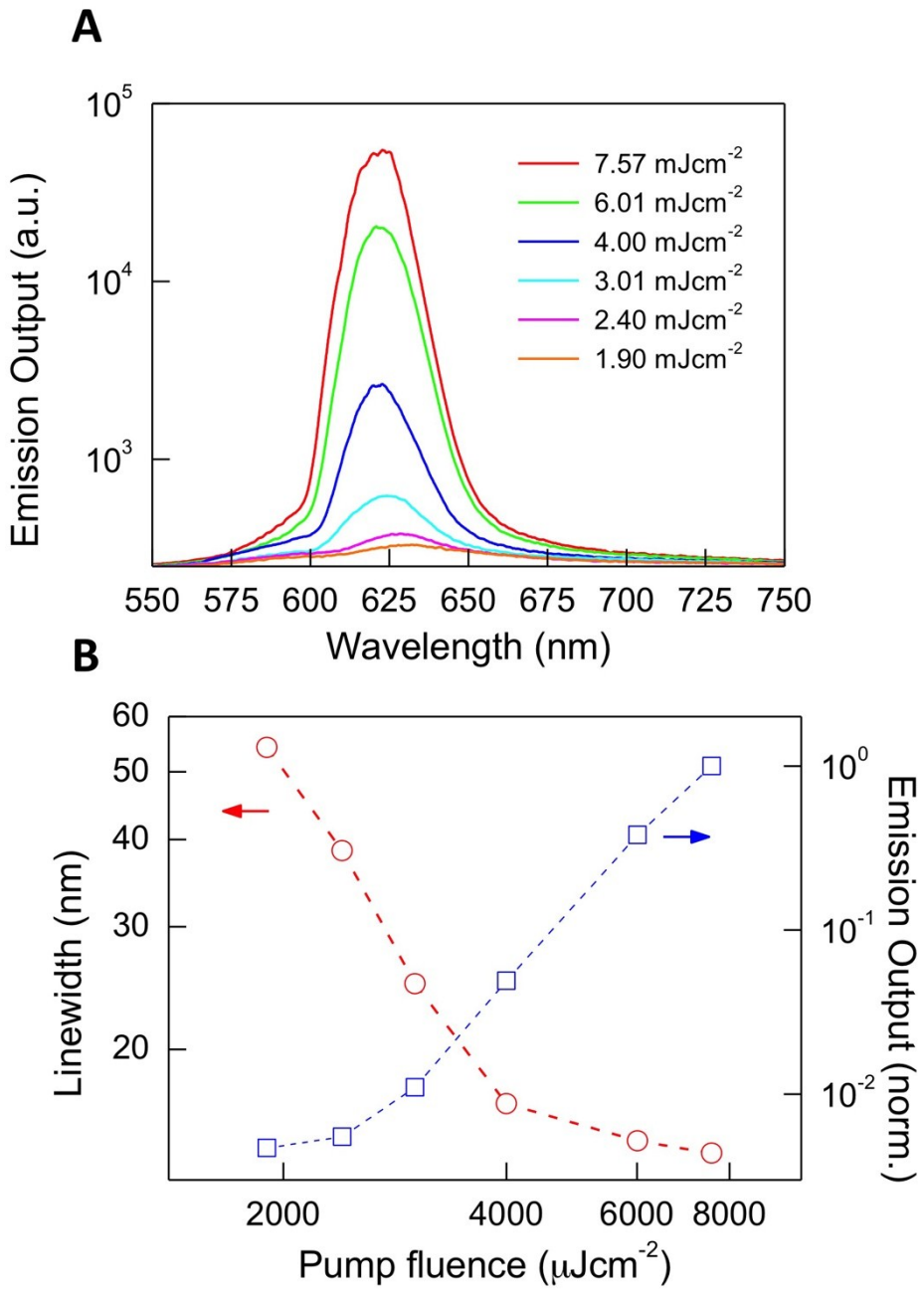

Figure S4. (A) A log-lin plot of the PL spectra upon different pump fluences. (B) Log-log plots of emission linewidth (circles, left Y-axis) and emission output normalized by the output at the highest fluence (squares, right Y-axis) versus pump fluence, (red and blue arrows indicate respectively their corresponding Y-axis).

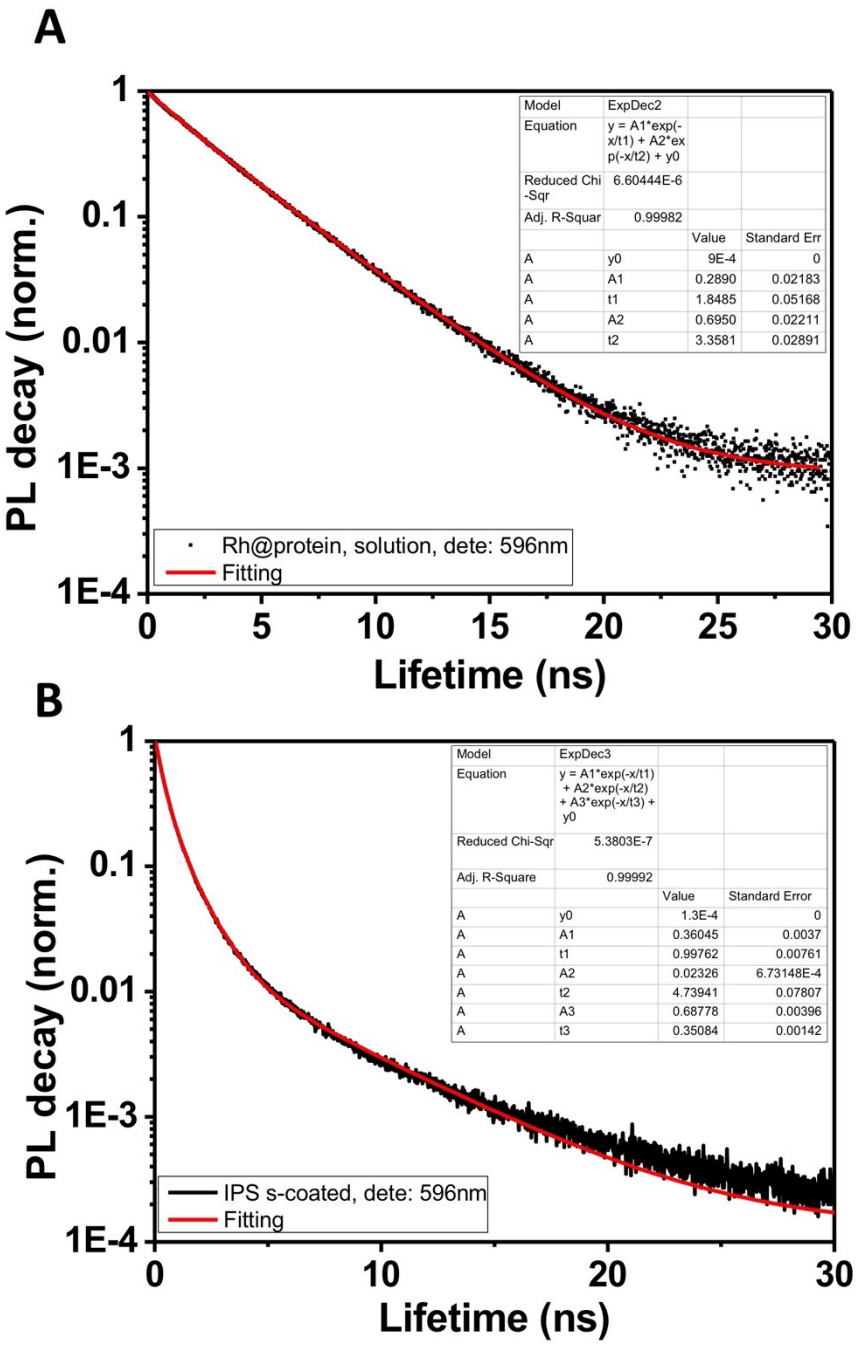

Figure S5. Time resolved PL decay curves on CTPR-RH6G in solution (A) and film (B). PL decays of solutions (films) were fitted according to a two- (three-) exponential law. Lifetimes were obtained as an intensity average of the components taking into account their respective statistical weight.

Table S1. Time resolved PL constants of CTPR-RH6G in solution and film.

Sample	X^2	A_1	τ_1 (ns)	A_2	τ_2 (ns)	A_3	τ_3 (ns)	τ_{av} (ns)	ϕ (%)	k_r (s^{-1})	k_{nr} (s^{-1})
Film	0.999	0.360	0.997	0.687	0.350	0.023	4.739	1.353	17	$1.2\ 10^8$	$6.2\ 10^8$
Solution	0.999	0.289	1.848	0.695	3.358	-	-	3.07	24.5	$0.8\ 10^8$	$2.5\ 10^8$

Where τ_{av} is the intensity-weighted average PL lifetime obtained from the individual lifetime components (τ_i) and their statistical weights in the fits (A_i) as:

$$\tau_{av} = \frac{\sum_i \tau_i A i^2}{\sum_i A_i}$$

whereas ϕ stands for the PL quantum efficiency and k_r and k_{nr} are the radiative and non radiative decay rates respectively determined as:

$$k_r = \frac{\phi}{\tau_{av}} \qquad k_{nr} = \frac{1-\phi}{\tau_{av}}$$

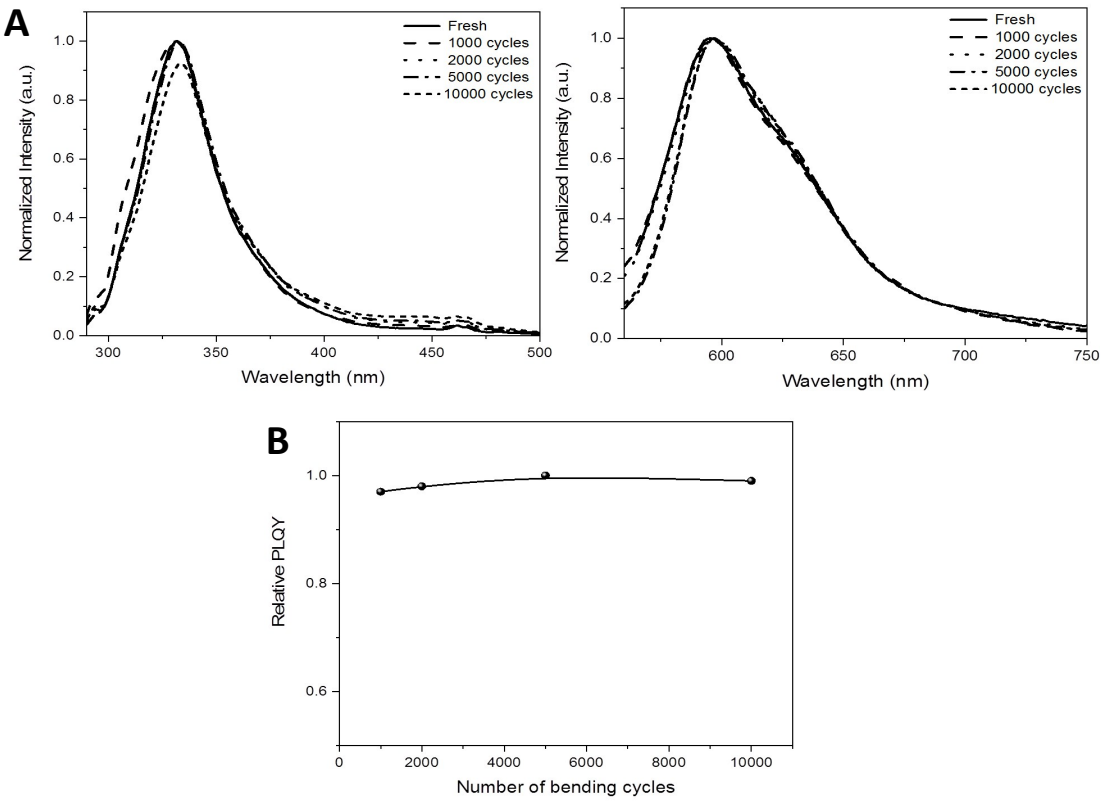

Figure S6. (A) Emission spectra of the CTPR-Rh films focusing on the emission of the CTPR (l_{exc}= 275 nm; left) and the Rh (l_{exc}= 550 nm; right) after each bending cycle (see legend). (B) Changes of the photoluminescence quantum yield (PLQY) after each bending cycle.

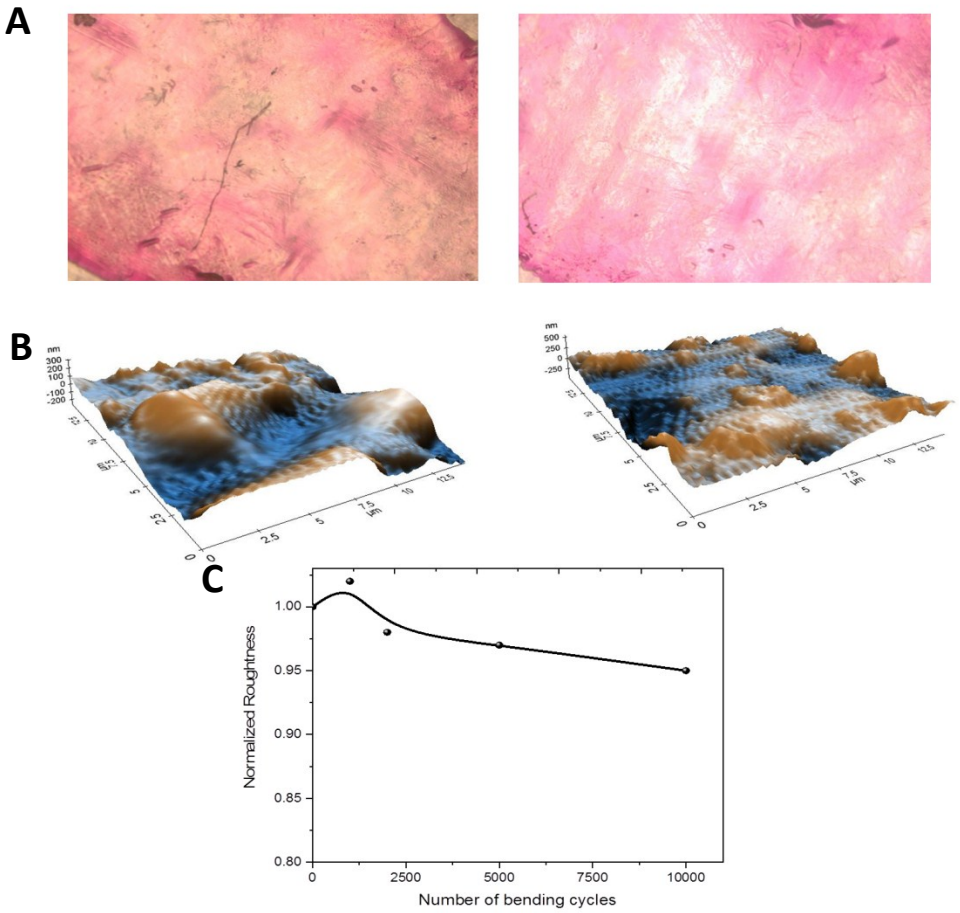

Figure S7. (A) Optical image of fresh (left) and after 10,000 bending cycles (right) of CTPR-Rh films. (B) AFM image of fresh (left) and after 10,000 bending cycles (right) of CTPR-Rh films. (C) Roughness changes versus number of bending cycles.

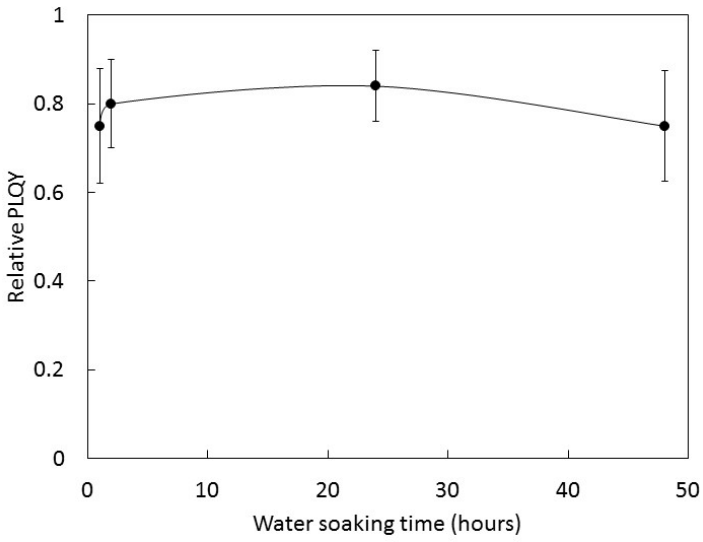

Figure S8. Photoluminescence quantum yield (PLQY) of CTPR-Rh6G nanopatterned cross-linked film upon several hours under moisture conditions.

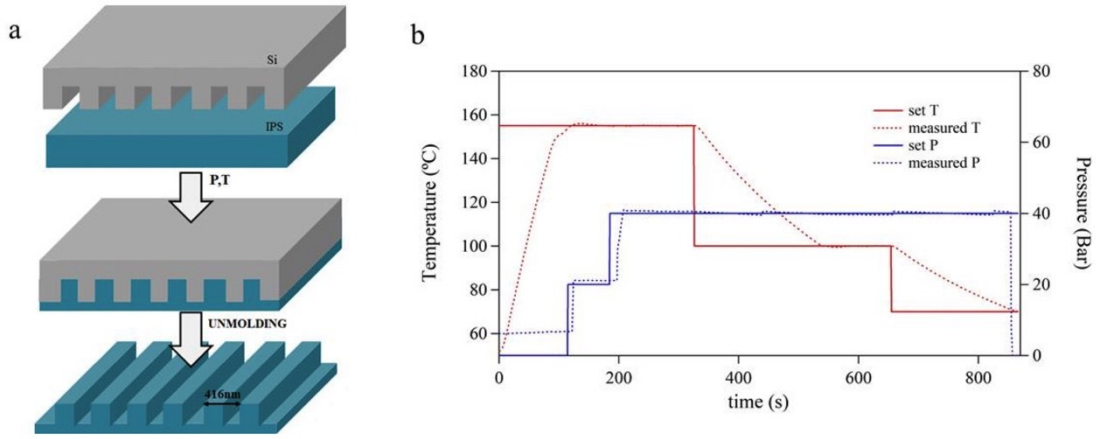

Figure S9. (a) Outline of the replication of a polymer grating from Si to IPS. (b) Temperature and pressure profiles during the nanoimprinting process.