

Fabrication of photosensitive multilayered films *via* Layer-by-Layer assembly with well controlled porous structure

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Fabrication of PLL (without APP)/DNA multilayered films

Poly-L-lysine (PLL) was synthesized according to the method mentioned in the “Synthesis of 5-(4-Aminophenyl)-10,15,20-triphenyl-porphyrin (APP) Terminated Poly-L-lysine (APP-PLL)” section in the paper with APP replaced by 5.5 mg propargylamine (Shanghai Reagent Chemical Co. (PR China), purified before use) for the ring opening polymerization of 600 mg zLL-NCA.

PLL/DNA multilayered films were fabricated *via* Layer-by-Layer assembly, and the assembly processes employed the general alternate dipping method mentioned in the “Fabrication of APP-PLL/DNA Multilayered Films” section in the paper.

Light illumination of APP/DNA multilayered films

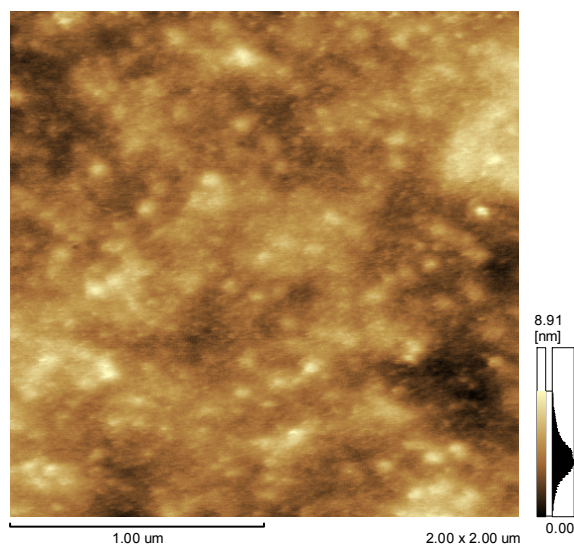
PLL/DNA multilayered films with 16 layers were dipped in DI water and were irradiated by using a Xe lamp set up in a solar simulator (Newport, USA) with a light intensity of 300 mW/cm², filtered by band-path filter of 400 nm for 180 min. And the films were then rinsed with plentiful DI water and dried under a stream of nitrogen before measurements.

Characterization of Multilayered Films

Thickness of PLL/DNA multilayered films was determined using profilometry (Taylor–Hobson S4C-3D). The thickness of each sample was determined in five different locations on the substrate surface. The thickness of the films before and after light illumination was 70.2 nm and 66.7 nm, respectively.

The morphology of PLL/DNA multilayered films after light illumination was characterized by a SPM-9500J3 (Shimadzu, Japan) atomic force microscope (AFM)

operated in the tapping mode. And the AFM image is shown in Supplementary Fig. 1.



Supplementary Fig. 1. AFM image of PLL/DNA multilayered films with 16 layers after 180 min light illumination.

The limit of the illumination effect on the APP-PLL/DNA multilayered films

To know the limit of the illumination effect on the porous size and thickness, APP-PLL/DNA multilayered films with 16 layers were fabricated and were illuminated with Xe lamp until no absorbance of porphyrin at 425 nm appeared in the UV-Vis spectrum of the films. The peak at 425 nm in the spectrum disappeared in about 5-6 h. The thickness of the films was measured as 12.1 nm.