

**Dynamics on Layer-by-Layer Assembly of Poly(acrylic acid)-Lanthanide
Complex Colloid and Poly(diallyldimethyl ammonium)**

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Experiments

For UV-visible spectroscopic characterization, the thin film deposited on quartz substrate, while for AFM and IR characterization, the films were deposited on silicon substrate. UV-Vis absorption spectra were obtained using a Shimadzu UV-2550 spectrophotometer. Fluorescence spectra were recorded with Shimadzu RF 5301. Atomic force microscopy (AFM) measurement was performed using Agilent 5500 instruments under the tapping mode. Commercialized silicon tips with 300 kHz resonance frequency and 40 N/m force constant were applied to scan the thin films. Root-mean-squared (RMS) roughness of the thin films was determined by analyzing the AFM images (5 μm \times 5 μm).

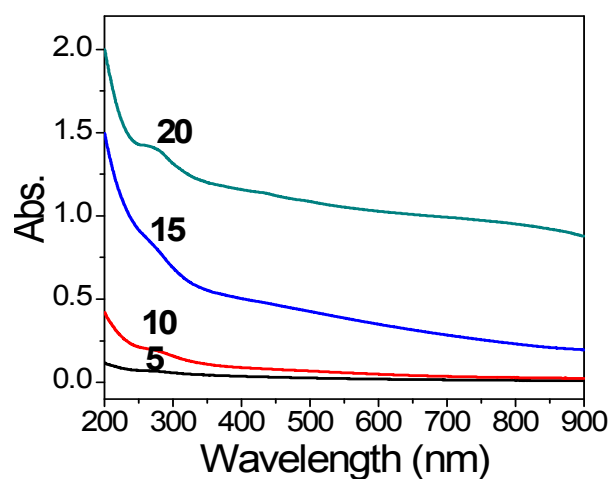


Figure S1 UV-Vis spectra of $[\text{PDDA}/(\text{PAA}@\text{Ce})]_n$ film ($n=5, 10, 15$ and 20). PAA-Ce complex colloidal particles were prepared through Protocol 3.

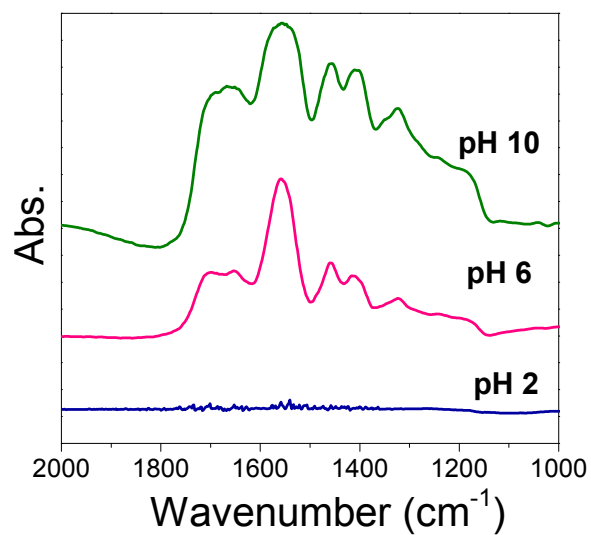


Figure S2 FT-IR spectra of the $[\text{PDDA}/(\text{PAA}@\text{Ce})]_{20}$ films. pH values of PAA-Ce colloidal solution and rinsing solution solutions are fixed at 6.0 while pH values of PDDA solutions varied.

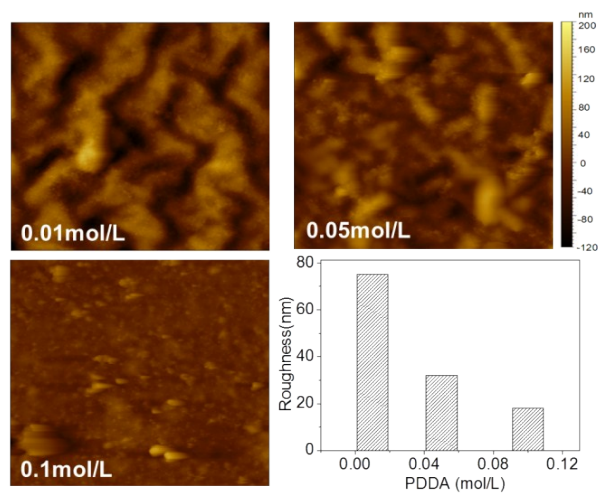


Figure S3 AFM images of $[\text{PDDA}/(\text{PAA}@\text{Ce})]_{20}$ thin films and films roughness. The films were prepared with PDDA of different concentrations: 0.01, 0.05 and 0.1 mol/L.

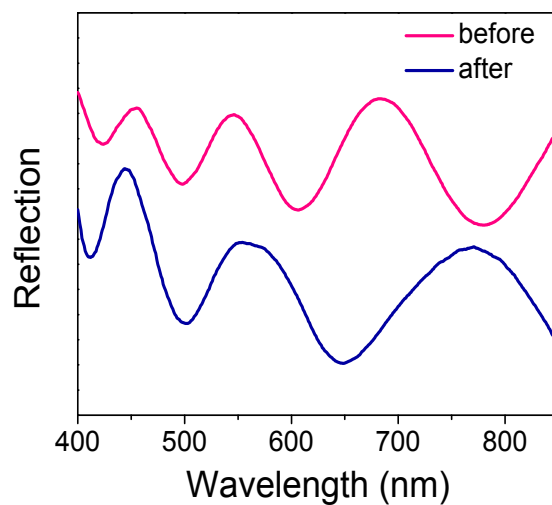


Figure S4 $[\text{PDDA}/(\text{PAA}@\text{Ce})]_{20}$ film before and after incubated in the 0.01 M PDDA solution for 24 h. The thickness is determined through Fabry-Perot fringes. Before incubation the thickness was 879 nm, and after incubation the thickness was about 697. There was 20 % thickness reduction.

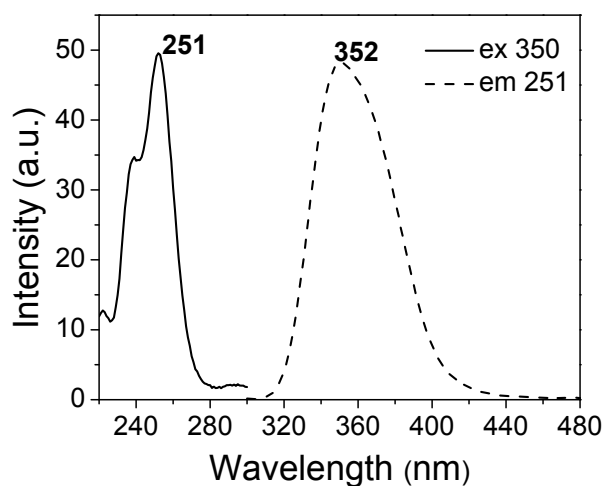


Figure S5 Fluorescence spectra of PDDA solution in which $[\text{PDDA}/(\text{PAA}@\text{Ce})]_{20}$ film was incubated for 24 h.

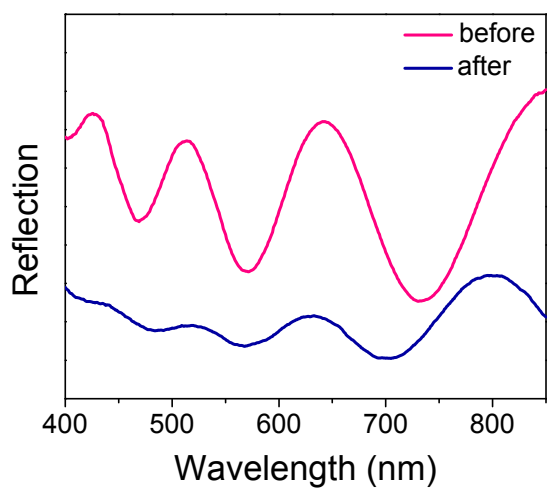


Figure S6 $[\text{PDDA}/(\text{PAA}@\text{Ce})]_{20}$ film before and after incubated in the 0.01 M CeCl_3 solution for 24 h. Before incubation the thickness was 833 nm, and after incubation the thickness was about 943. There was 13 % thickness increment.

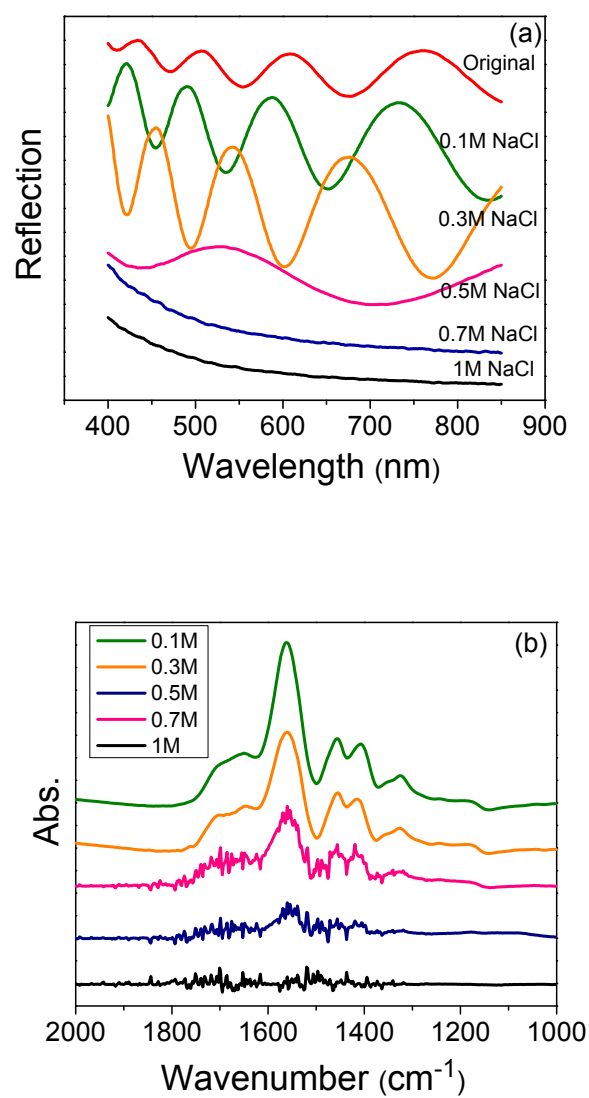


Figure S7 Reflection spectra (a) FT-IR spectra (b) of [PDDA/(PAA@Ce)]₂₀ film after incubation in NaCl solutions of different concentration for 24 h.