Electronic Supplementary Material (ESI) for Polymer Chemistry.

Towards Mussel-Like On-Demand Coatings: Light-Triggered Polymerization of Dopamine through Photoinduced pH Jump

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Supporting Information

Materials

Dopamine.HCl (98%), hydrochloric acid (37%) phenylglyoxilic acid (97%), 1,5,7-triazabicyclo[4.4.0]-dec-5-ene (98%), tetramethylguanidine (99%), were purchased from Sigma Aldrich. 1,5-diazabicyclo-[4.3.0]-non-5-ene was obtained from ABCR and 1,8-diazabicyclo-[5.4.0]-undec-7-ene from Alfa Aesar. All products were used as received.

PBG Synthesis

An equimolar of phenylglyoxylic acid and corresponding amine (TMG, DBN, DBU, and TBD) was mixed overnight at room temperature in chloroform, and then the solvent was evaporated. The resulting solid was further purified by recrystallization from diethyl ether.[1]

1. H. Salmi, X. Allonas, C. Ley, A. Defoin and A. Ak, *Polymer Chemistry*, 2014, **5**, 6577-6583.

pH measurement

The pH of the solution was measured at room temperature using a Ph 700 from Eutech instrument and a ECFC725101B pH electrode. All PBG were dissolved in distilled water at a concentration of 6.6×10^{-2} M and the pH was adjusted by addition of drops of a 1.2M hydrochloric acid solution. Then the solution was irradiated by UV for almost 40 min using Hg-Xe arc lamp (equipped with a 548 nm reflector).

Characterization of the dopamine polymerization by UV-vis spectra

The reactivity of dopamine was measured at room temperature using UV-vis spectroscopy (Specord 210 from Analikjeba) at a wavelength from 250 to 700 nm.

The dopamine.HCl concentration was fixed at 0.5mg/ml (in order to follow the polymerization on a higher period of time). For UV experiments, dopamine.HCl was added into a 6.6×10^{-2} M PBG_{DBN} solution and pH adjusted using 1.2M HCl if necessary. Then the solution was irradiated by UV for 20 min. Aliquots were filled into 1cm polystyrene cells for UV-vis measurement at different time during the polymerization.

Polydopamine coating

Cleaned substrates were immersed in the solution of 2 mg/ml dopamine HCl mixed with 6.6×10^{-2} PBG_{DBN} for several hours after a first step of irradiation (20 min). After the coating, substrates were rinsed with distilled water and acetone follow by 24h of drying.

Surface characterization

Two kinds of substrates were used for surface characterization, 2024 bare Aluminum and conventional glass microscope slides.

The wettability of the film surface was characterized on the basis of static contact angle measurement using a contact angle goniometer (DSA 100, Krüss). Five measurements were averaged to obtain reliable values.

SEM and EDX measurements were realized on aluminum coated substrates using a JCM-6000 benchtop Scanning Electron Microscopy from JEOL coupled with a JED-2300 EDS unit at ambient temperature. Three measurements were averaged.

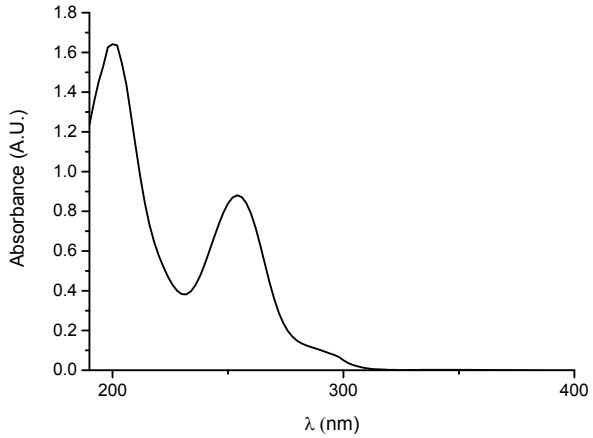

Figure S1: UV absorption spectra of PBG_{DBN}

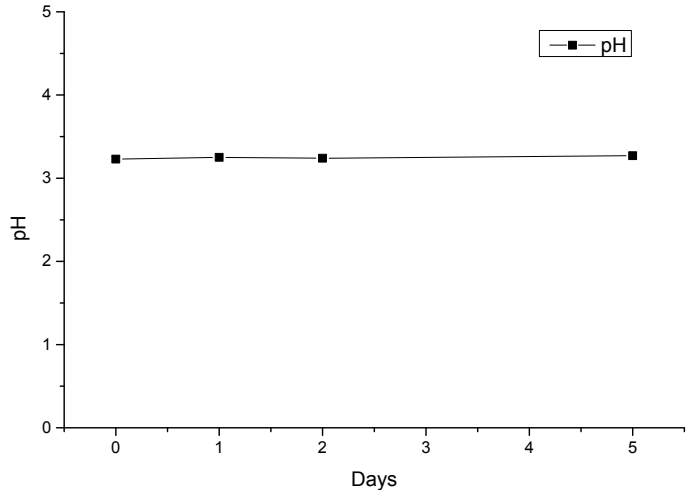

Fig. S2: pH stability over 6 days of a DBN solution.

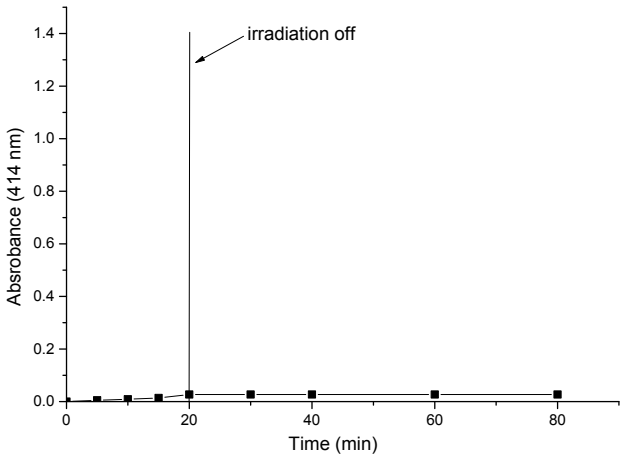

Fig. S3: UV-visible absorbance evolution of Dopamine solution at pH=5 without PBG.