

Supporting Information for

A Polydiacetylene-Based Fluorescent Sensor Chip

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Materials. 10,12-pentacosadiynoic acid (PCDA) was purchased from GFS Chemicals. 2,2'-(Ethylenedioxy)bis-(ethylamine) (EDEA), ethylenediamine (EDA), poly(acrylic acid) (Mw: 2000) were purchased from Aldrich. Cyclodextrins were obtained from TCI. The aldehyde modified glass substrates were purchased from CEL Associate INC (CSS 100 silylated glass). The diacetylenic monomer PCDA-EDEA¹ and PCDA-EDA² were prepared according to the literature procedures.

Diacetylene Liposome Solution: A mixture of the amine terminated diacetylene monomers PCDA-EDEA and PCDA-EDA was dissolved in chloroform in a test tube. The solvent was evaporated by a stream of N₂ gas and HEPES (5 mM, pH 8.0) buffer was added to the test tube to give the desired concentration of lipid (1 mM). The resultant suspension was sonicated (Fisher sonic dismembrator model 550) for 15 min at a temperature of around 80 °C. Following sonication, the solution was filtered to remove dispersed lipid aggregates by using 0.8 µm filter and cooled at 4 °C for overnight.

Immobilization: An aldehyde modified glass substrate was placed in the diacetylene liposome solution at 37 °C for designated periods of time. After rinsing the glass with deionized water and drying under a stream of nitrogen, the immobilized glass was irradiated with 254 nm UV light (1 mW/ cm²) for designated periods of time.

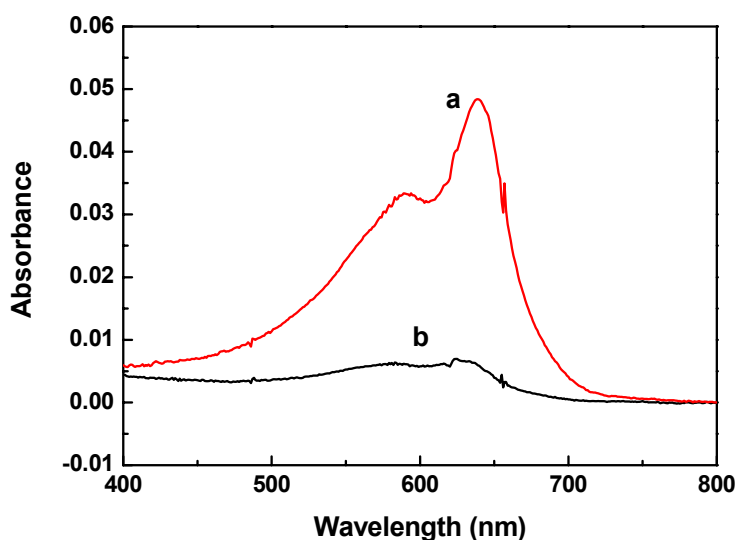


Figure S1. Visible spectra of the glass substrate immobilized with diacetylene liposomes (1:1 mixture (molar ratio) of PCDA-EDEA and PCDA-EDA) after irradiation with UV-light (254 nm, 1mW/cm²) for 8 min. (a: aldehyde-modified glass substrate, b: unmodified glass substrate)

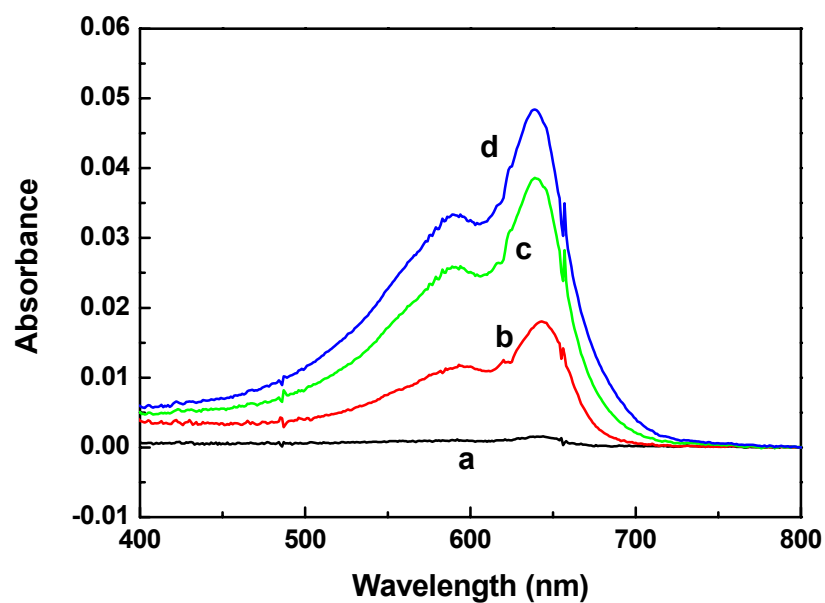


Figure S2. Visible spectra of the glass substrate immobilized with diacetylene liposomes (1:1 mixture (molar ratio) of PCDA-EDEA and PCDA-EDA) after irradiation with UV-light for 0 (a), 1 (b), 4 (c), 8 min (d), respectively.

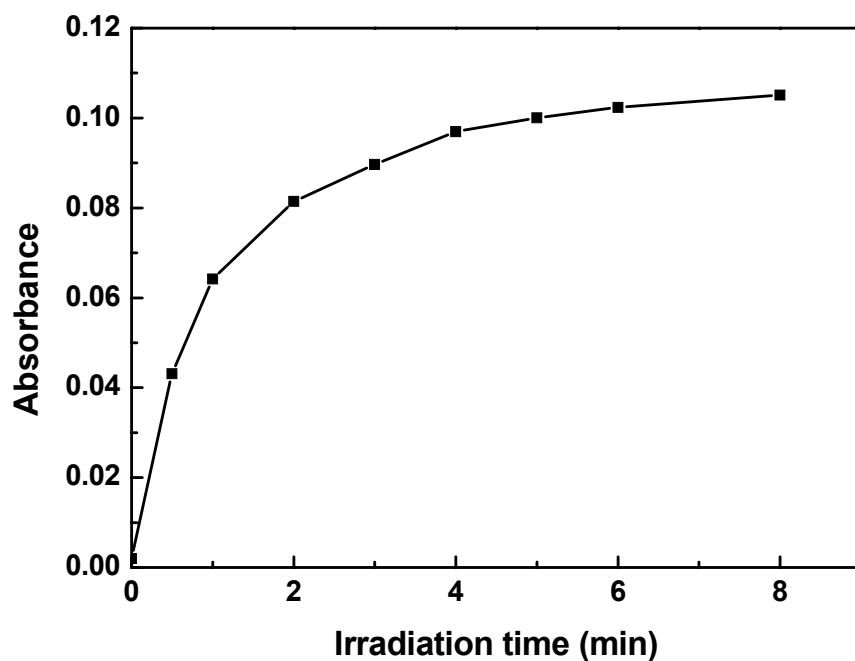


Figure S3. Absorbance of the immobilized PDAs measured at 640 nm as a function of irradiation time. (PCDA-EDEA: PCDA-EDA = 1: 1 (molar ratio), incubation time: 24 h).

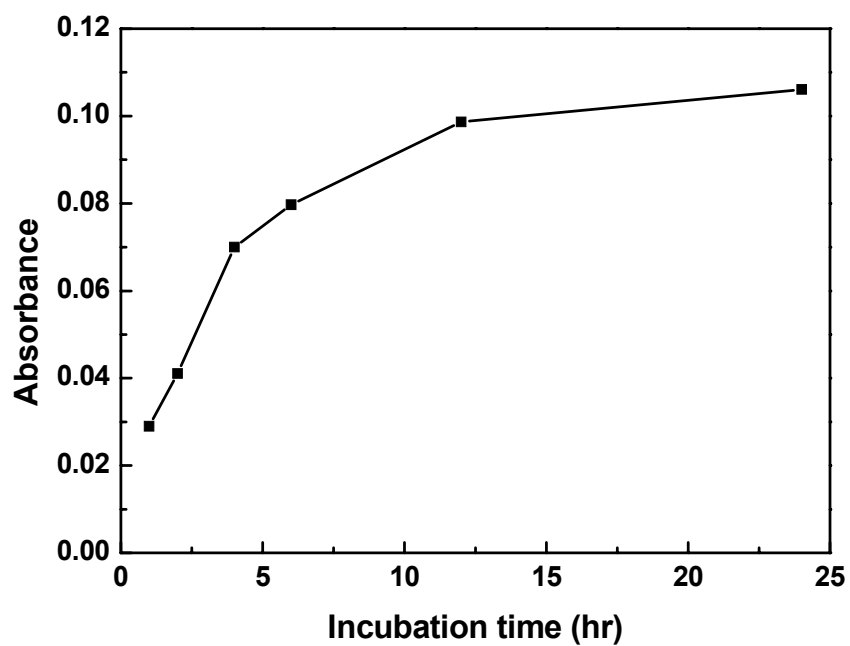


Figure S4. Absorbance of the immobilized PDAs measured at 640 nm as a function of incubation time. (PCDA-EDEA: PCDA-EDA = 1: 1 (molar ratio), irradiation time: 8min).

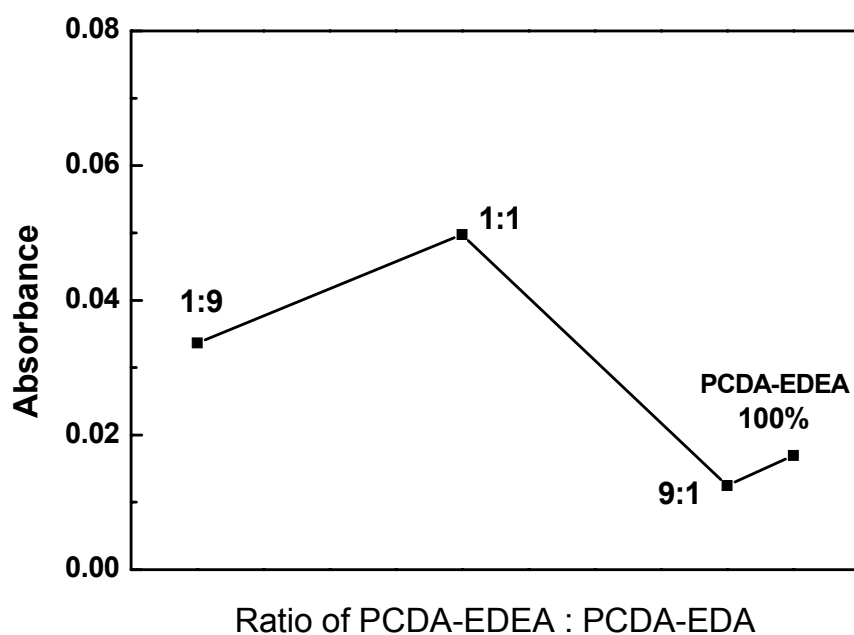


Figure S5. Absorbance of the immobilized PDAs measured at 640 nm as a function of composition (molar ratio) of PCDA-EDEA and PCDA-EDA. (incubation: 4 h, irradiation: 8 min)

Patterned Fluorescent Images: Figure S6 shows the procedures employed for the preparation of patterned fluorescence images. An aldehyde-modified glass substrate was incubated in the solution derived from a mixture of PCDA-EDEA and PCDA-EDA (1;1, molar ratio) at 37 °C for 4 h. The glass substrate immobilized with diacetylene vesicles was irradiated with UV light for 4 min through a photomask. This process would induce photopolymerization of the immobilized diacetylene vesicles in the exposed areas. The glass substrate was then heated at 100 °C for 10 s to induce the blue-to-red color shift of the polydiacetylene molecules. The patterned fluorescent images were observed under a fluorescent microscope (Olympus BX51 W/DP70). Figure S7 shows the image patterns obtained.

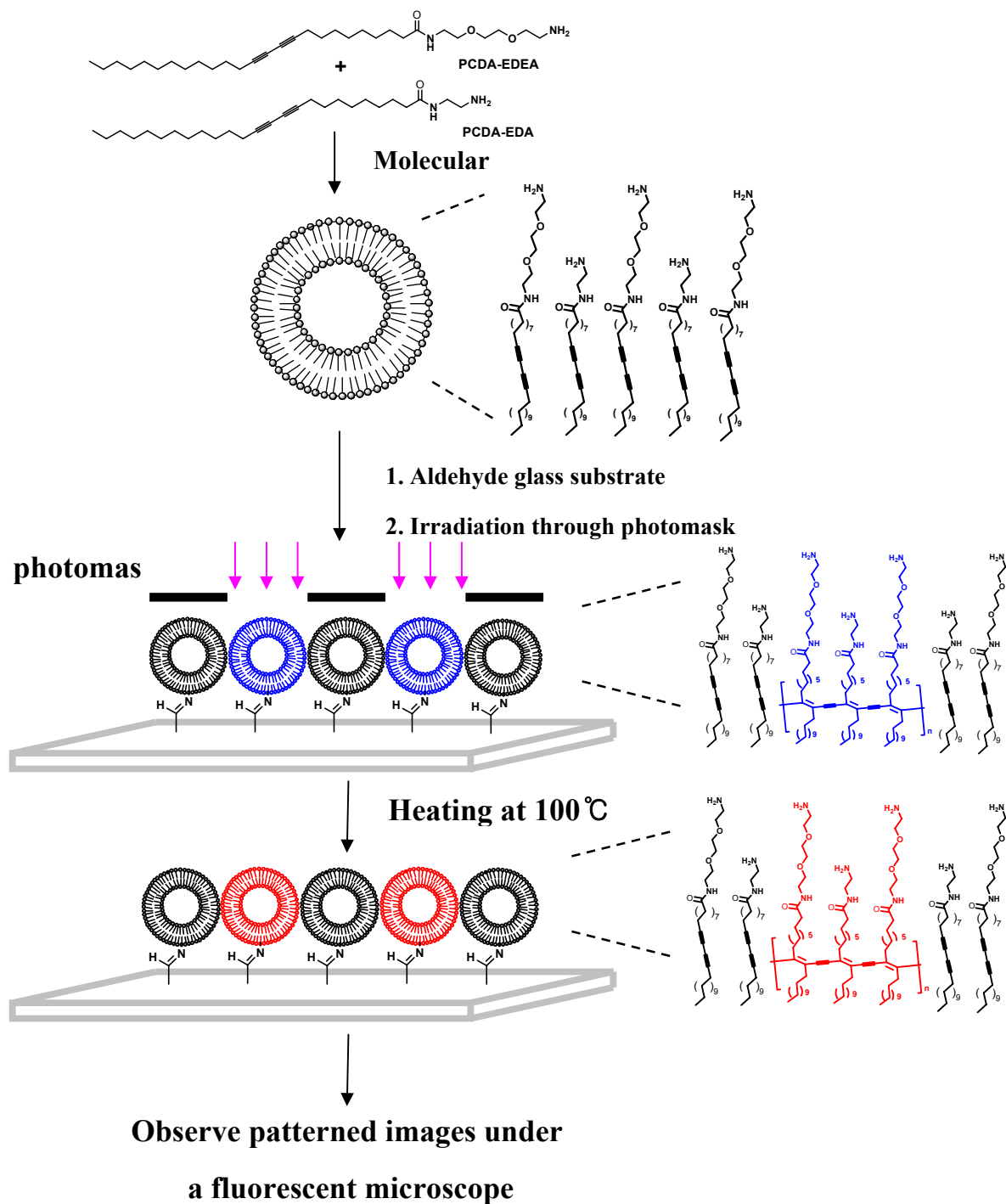


Figure S6. Procedures for patterned fluorescent images using the photolithographic method.

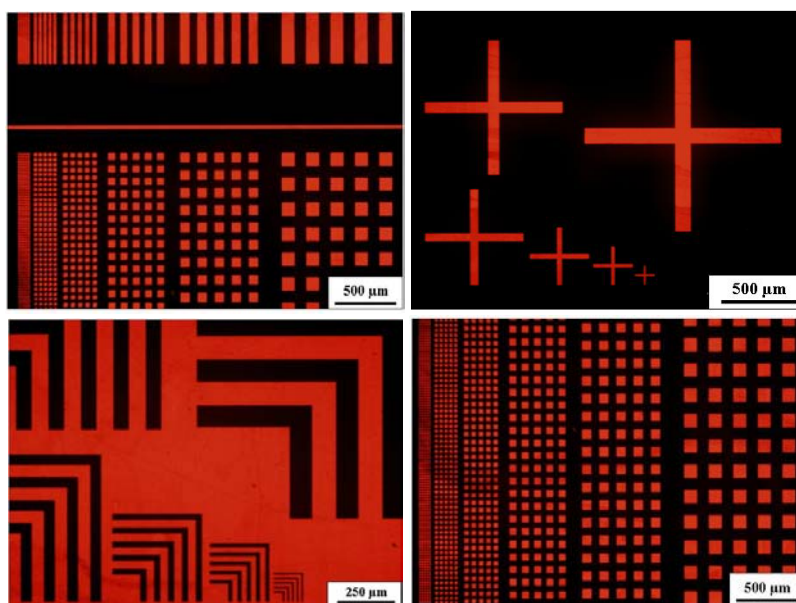


Figure S7. Patterned fluorescent images obtained from the immobilized diacetylene vesicles prepared with a 1:1 mixture (molar ratio) of PCDA-EDEA and PCDA-EDA.

Microarray-based Fluorescence Profiles: The aldehyde-modified glass substrates were spotted with PDAs prepared with a 1:1 mixture (molar ratio) of PCDA-EDEA and PCDA-EDA using a microarrayer (GESIM Nanoplotter Model 1.2) with pitch of 500 μm between spots. Printed slides were exposed to a HEPES buffer (5 mM, pH 8.0) solution (80 μL , HYB 4 Chamber) containing 30 mM of α -CD, γ -CD, or maltoheptaose (MH) at room temperature for 2 h. Experiment with polyacrylic acid (PAA) was carried out in deionized water. The fluorescence profiles were recorded using a fluorescent microscope (Olympus BX51 W/DP70). The amount of analyte solution could be reduced to 10 μL when a cover glass was used instead of the chamber after loading the analyte solution (Figure S8).

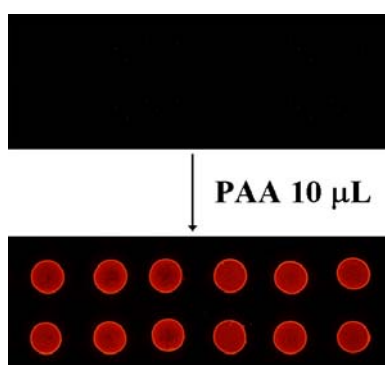


Figure S8. Fluorescent images obtained from exposure (12 h) of PDA immobilized vesicles to 10 μL of PAA solution (30 mM).

Quantitative Data of Dot Intensities with Various Concentrations of α -CD and PAA

The aldehyde-modified glass substrates were spotted with PDA liposome using a micro-arrayer with pitch of 1 mm between spots. Then the slides were incubated in a solution containing various concentrations of α -CD (HEPES buffer, 5 mM, pH 8.0) at 35 °C and PAA (deionized water) at 25 °C for 12 h. The fluorescence profiles were recorded using a fluorescent microscope and the quantitative data of dot intensities were analyzed using an Analysis Pro (SIS, Germany). The data were obtained with six independent experiments.

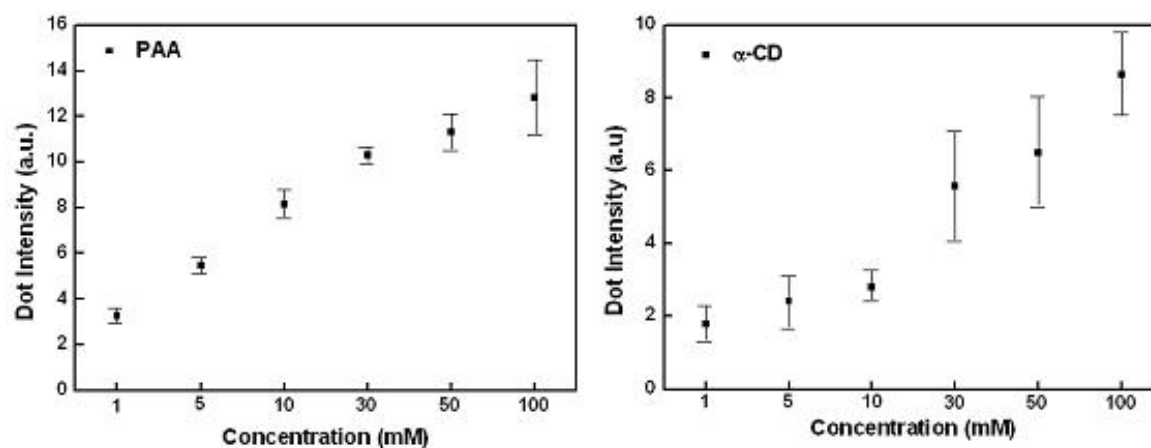


Figure S9. Fluorescence intensity as a function of concentration of PAA (left) and α -CD (right).

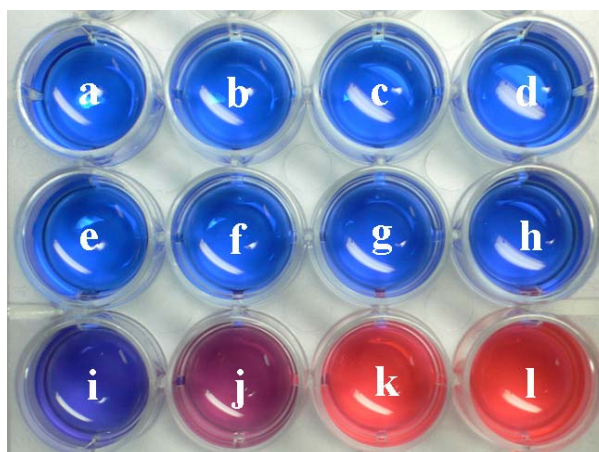


Figure S10. Photographs of PDA solutions in the presence of α -CD: buffer only (a), 0.001 (b), 0.005 (c), 0.01 (d), 0.05 (e), 0.1 (f), 0.5 (g), 1 (h), 5 (i), 10 (j), 30 (k), 50 mM (l), respectively. Photographs were taken after 1 h incubation.

References

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2. Okada, S.; Peng, S.; Spevak, W.; Charych, D. *Acc. Chem. Res.* **1998**, *31*, 229.