Supporting Information

Surface functionalization of a polymeric lipid bilayer for coupling a model biological membrane with molecules, cells, and microstructures

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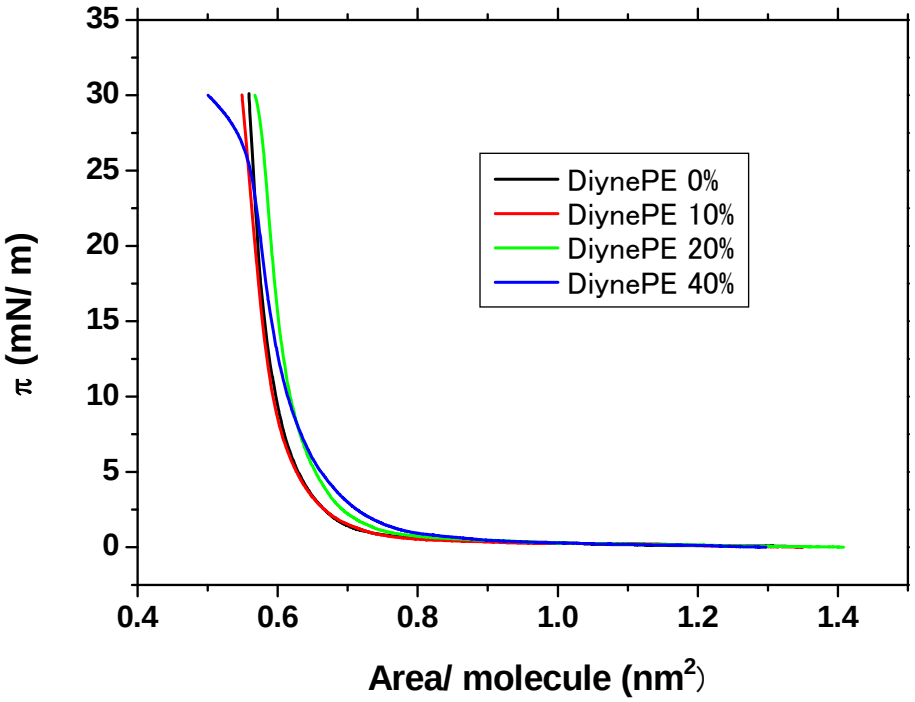

Figure S1: π-A isotherms of DiynePC/ DiynePE mixed monolayers with varied compositions. The fraction of DiynePE was 0% (black), 10% (red), 20% (green), and 40% (blue). The subphase temperature was controlled at 16 °C.

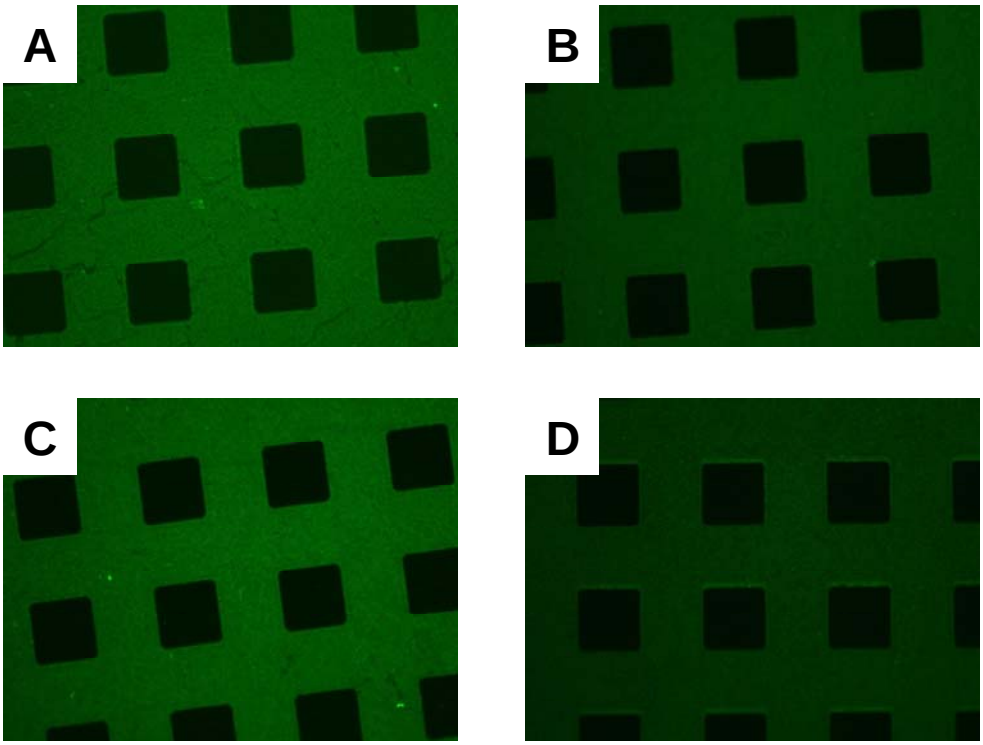

Figure S2: Fluorescence micrographs of polymerized DiynePC/ DiynePE bilayers. Fluorescence arising from conjugated ene-yne bonds in the polymeric backbone was observed with green fluorescence. The fraction of DiynePE was 0% (A), 10% (B), 20% (C), and 40% (D). The size of corrals was 20 μm.

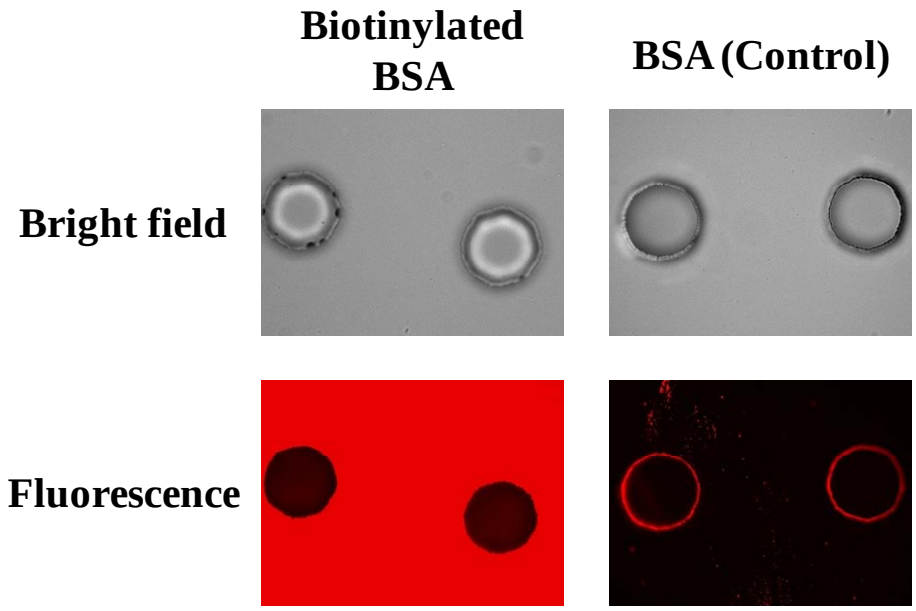

Figure S3: Adsorption of biotinylated BSA onto PDMS: The surface of PDMS was functionalized by adsorbing biotinylated BSA. Fluorescent streptavidin, SAF594, was applied to check the biotin functionalization of the surface. Left: Biotinylated BSA was adsorbed onto PDMS. Right: BSA (no biotin attached) was adsorbed onto PDMS. Bright field images (upper side) and fluorescence images (lower side). SAF594 adsorbed onto the PDMS with biotinylated BSA, but its adsorption was minimal on the PDMS covered with BSA (the ring-shaped emission is mainly due to scattered light at the walls of microwells). The size of microwells was 100 μm (center-to-center distance: 300 μm).

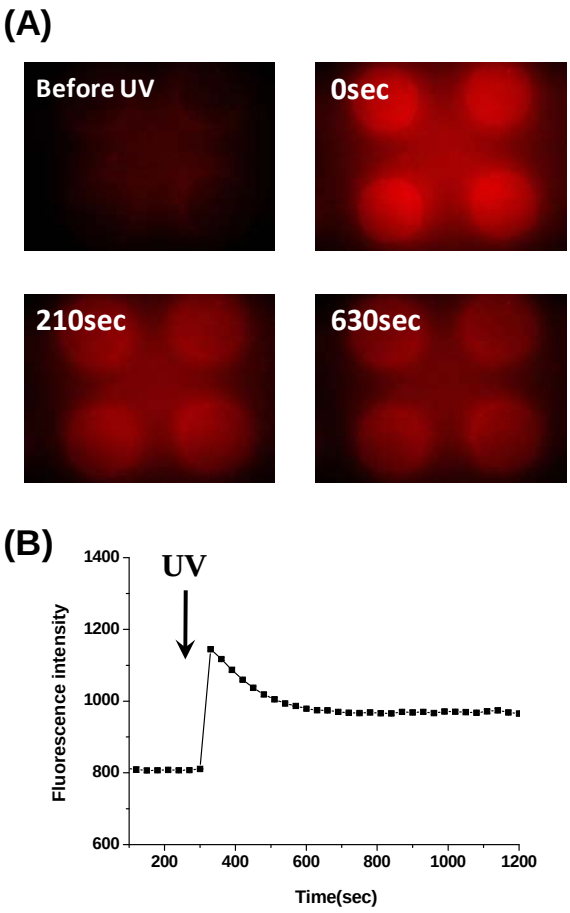

Figure S4: Activity assay of P450 (h-CYP1A1) in a micropatterned membrane without confining the reaction solution in PDMS microwells. A PDMS sheet having regularly arrayed microwells (diameter: 100 μm, depth: 50 μm, center-to-center distance: 200 μm) was physically pressed onto the micropatterned membrane. (The surfaces of PDMS and polymeric bilayer were *not* functionalized with biotin.) The aqueous solution between the membrane and PDMS contained 7-ER, $NADP^+$, and caged-G6P. The enzymatic reaction was initiated by the UV illumination, and red fluorescence due to the enzymatic conversion of 7-ER into resorufin was observed in microwells (A: the elapsed time after the UV illumination is given in the images). (B) Time course of the resorufin fluorescence intensity in the microwells. The timing of the UV illumination is given with an arrow. The fluorescence intensity increased temporarily and decreased again, presumably due the leakage of G6P and the product (resorufin).

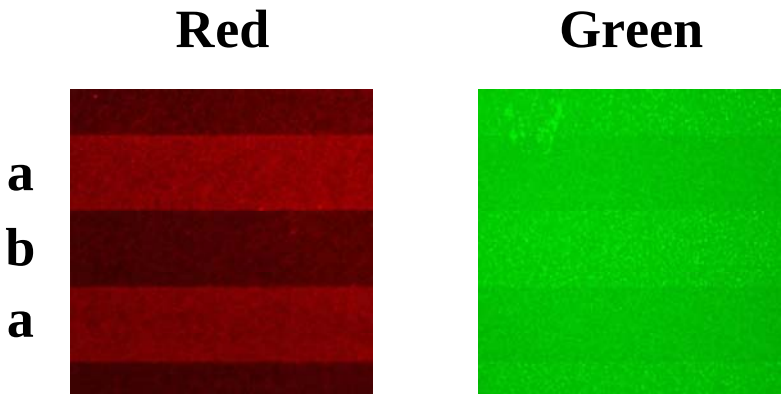

Figure S5: All polymeric micropatterned bilayer composed of DiynePC and DiynePC/DiynePE (98.5: 1.5). Two types of polymeric bilayers were successively deposited and lithographically polymerized (a: DiynePC/DiynePE, b: DiynePC). The surface of DiynePC/DiynePE was functionalized with biotin by grafting NHS-PEG_4-biotin. Binding of SAF594 was observed on the bilayer region of DiynePC/DiynePE (red), whereas the fluorescence arising from polymeric bilayer was almost indistinguishable in two regions (green). The stripe width was 20 μm.