Functionalized Electrospun Nanofibers as Bioseparators in Microfluidic Systems

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Supporting Information

Experimental Procedures

Preparation of SRB-liposomes

Liposomes encapsulating 150 mM sulforhodamine B (SRB) dye were prepared as described in prior publications.^{1,2} Briefly, liposomes are prepared using 1,2-Dipalmitoyl-*sn*-glycero-3-phosphocholine (DPPC), 1,2-dipalmitoyl-*sn*-glycero-3-[phosphor-rac-(1-glycerol)] (DPPG), cholesterol, and *N*-glutaryl 1,2-dipalmitoyl-*sn*-glycero-3-phosphatidylethanolamine (*N*-glutaryl DPPE) (40.9:20.1:51.7:7.3 μ mol, respectively). Additionally, the liposome membranes incorporate 0.44 mol% (of total lipid) 1,2-dipalmitoyl-*sn*-glycero-3-phosphoethanolamine-N-(lissamine rhodamine B sulfonyl) (ammonium salt) to facilitate fluorescence microscopy imaging. These components are dissolved in a solution containing 3 mL chloroform, 0.5 mL methanol, and 3 mL isopropyl ether and sonicated in a bath sonicator (VWR Aquasonic Model 150D) for 1 minute at level 6. A SRB dye solution at 45°C (2 mL SRB, 150 mmol L⁻¹ in 0.2 mol L⁻¹ HEPES, pH 7.5) was added to the lipid mixture and was then sonicated for 4 minutes. This mixture was added to a rotary evaporator to remove the solvent. The mixture was then extruded twenty-one times at 60 °C through 2.0 μ m Nucleopore membranes and then extruded twenty-one times through 0.6 μ m membranes. The resulting liposomes were added to a 20 x 1.7 cm column filled with Sephadex G-50 at 4 mL min⁻¹ using 1 x HEPES-sucrose-saline buffer. The liposome-containing fractions were then combined with HSS and dialyzed overnight.

The SRB encapsulating liposomes exhibit a negative surface charge and are consequently attracted to the positive charge of polybrene-poly(vinyl alcohol) nanofibers at pH 7 and are repelled by the negative charge of poly(methyl vinyl ether-alt-maleic anhydride)-poly(vinyl alcohol) nanofibers.

Bonding Procedure

Bonding takes place at 90°C on a Carver Laminating Hot Press. PMMA that has been embossed with microchannels is first rinsed with isopropanol in a bath sonicator for 5 minutes. Then it is rinsed in DI water. An Ultra Violet Ozone (UVO) cleaner is used to treat PMMA pieces that have been embossed with channels for 10 minutes at 0.5 liters per minute (LPM) of oxygen. PMMA pieces with nanofibers are treated in the UVO cleaner for 3 minutes at 0.5 LPM oxygen to prevent damage to nanofiber integrity. Then, the PMMA embossed with channels and PMMA with nanofibers are sandwiched together between two pieces of copper and placed on the hot press. The sandwich is placed (without applied pressure) on the hot press for 5 minutes to allow it to come up to the correct temperature. Then, 8,000 lbs of pressure is

applied to the sandwich for 5 minutes. After 5 minutes, if there are air bubbles in the PMMA sandwich assembly, the sandwich assembly is rotated 90°C and pressed again for 5 minutes at 8,000 lbs pressure.

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