Electronic Supplementary Information for:

Biomimetic graphene for enhanced interaction with the external membrane of neural cells

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Contents:

1. Synthesis

12-(Acryloyloxy)-1-dodecanol (**1**). Under N_2 atmosphere, 1,12-Dodecanediol (3.6 g, 18 mmol) was solubilised in 40 mL of dry THF by stirring at about 35 °C. Pyridine (0.57 mL, 7.15 mmol) was added and the solution was cooled to room temperature (r.t.). Acryloyl chloride (0.4 mL, 5 mmol) dissolved in 3 mL of dry THF was slowly added dropwise and the reaction was left under stirring overnight. The mixture was filtered to remove pyridine hydrochloride. The filtrate was evaporated under reduced pressure and the crude product was purified by flash chromatography on silica gel (CH_2Cl_2 : MeOH = 97 : 3). 700 mg of a clear oil were obtained (Y = 62%).

^{1}H-NMR (400 MHz, $CDCl_3$) δ 6.39 (dd, ^{2}J = 1.6 Hz, ^{3}J = 17.6 Hz, 1H), 6.12 (dd, ^{3}J = 10.4 Hz, ^{3}J = 17.6 Hz, 1H), 5.81 (dd, ^{2}J = 1.6 Hz, ^{3}J = 10.4 Hz, 1H), 4.14 (t, 2H), 3.64 (t, 2H), 1.66 (m, 2H), 1.56 (m, 2H), 1.27 (m, 16H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ 166.4, 130.4, 128.6, 64.7, 63.1, 32.8, 29.6, 29.5, 29.5, 29.4, 29.2, 28.6, 25.9, 25.7.

12-(Acryloyloxy)-1-dodecanoic Acid (**2**). Pyridinium dichromate (1.5 g, 28 mmol) in 15 mL of dry DMF was stirred at 0°C and 12-(Acryloyloxy)-1-dodecanol (2.25 g, 8.8 mmol) dissolved in 5 mL of dry DMF was slowly added dropwise. The reaction was left reaching r.t. and was stirred overnight. After 24 h the reaction mixture was poured into 100 mL of H_2O and extracted 5 times with Et_2O. The combined organic layers were dried over Na_2SO_4. The solvent was evaporated and the crude

product was purified by flash chromatography (CH_2Cl_2 : MeOH = 97 : 3). 1 g of a white solid was obtained (Y = 42%).

^{1}H-NMR (400 MHz, $CDCl_3$) δ 6.39 (dd, ^{2}J = 1.6 Hz, ^{3}J = 17.6 Hz, 1H), 6.12 (dd, ^{3}J = 10.4 Hz, ^{3}J = 17.6 Hz, 1H), 5.81 (dd, ^{2}J = 1.6 Hz, ^{3}J = 10.4 Hz, 1H), 4.15 (t, 2H), 2.35 (t, 2H), 1.64 (m, 6H), 1.27 (m, 12H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ 179.8, 166.4, 130.4, 128.6, 64.7, 34.0, 29.4, 29.3, 29.2, 29.2, 29.0, 28.6, 28.5, 25.9, 24.6.

1-Palmitoyl-2-[12-(acryloyloxy)dodecanoyl]-sn-glycero-3-phosphocholine (**4**). To a suspension of 1-Palmitoyl-2-hydroxy-sn-glycero-3-phosphocholine **3** (70 mg, 0.14 mmol) in 4 mL of ethanol-free $CHCl_3$, were added DMAP (17 mg, 0.14 mmol), DCC (35 mg, 0.17 mmol), 12-(Acryloyloxy)-1-dodecanoic Acid **2** (76 mg, 0.28 mmol) and 250 mg of glass beads. The mixture was sonicated at 25 °C for 5 h. After sonication, the glass beads were removed, the solvent evaporated under reduced pressure and the crude product purified by flash-chromatography on silica gel (CH_2Cl_2 : MeOH = 97:3 to CH_2Cl_2: MeOH : H_2O = 65 : 25 : 10). The product was dissolved in CH_2Cl_2 and filtered. The filtrate was concentrated under reduced pressure to obtain 40 mg of a white solid (Y = 40%).

^{1}H-NMR (400 MHz, $CDCl_3$) δ 6.38 (dd, ^{2}J = 1.6 Hz, ^{3}J = 17.2 Hz, 1H), 6.11 (dd, ^{3}J = 10.4 Hz, ^{3}J = 17.2 Hz, 1H), 5.81 (dd, ^{2}J = 1.6 Hz, ^{3}J = 10.4 Hz, 1H), 5.19 (bs, 1H), 4.33-4.40 (m, 3H), 4.14 (t, 2H), 4.11 (m, 1H), 3.94 (bs, 2H), 3.84 (bs, 2H), 3.38 (s, 9H), 2.28 (m, 4H), 1.56-1-67 (m, 6H), 1.25 (m, 38H), 0.87 (t, 3H). ^{13}C-NMR (100 MHz, $CDCl_3$) δ 173.6, 173.2, 166.3, 130.4, 128.6, 70.5, 66.4, 64.7, 63.5, 62.9, 59.3, 54.5, 34.3, 34.1, 31.9, 29.7, 29.6, 29.5, 29.5, 29.4, 29.3, 29.3, 29.2, 29.2, 29.1, 28.6, 28.5, 25.9, 24.9, 24.9, 22.7, 14.1.

GO-Br: GO (100 mg) was loaded in a round bottom flask and sonicated in DMF (3 mL) for 1.5 h. The resulting colloidal suspension of GO was immersed in an ice bath, then TEA (2 mL) and α-bromoisobutyryl bromide (3 mL) were added. The resulting dark, viscous solution was stirred for 24 h. The mixture was diluted with chloroform and centrifuged for 15' at 14000 rpm. The supernatant was removed and the washing cycle was repeated two more times with chloroform and then three times with Milli-Q water. The solid obtained was dried under vacuum. About 100 mg of a black powder were obtained. Elemental analysis: N % = 2.95 C % = 53.14 H % = 2.86 S % = 0.85.

2. Experimental details

2.1 X-Ray Photoelectron spectroscopy (XPS)

XPS spectra were acquired with a PHI 1257 spectrometer equipped with a monochromatic Al Kα source (hv= 1486.6 eV) with a pass energy of 11.75 eV, corresponding to an overall experimental resolution of 0.25 eV. The spectra were fitted with Voight line shapes and Shirley or linear

backgrounds. The spectra were aligned to the substrate-related Au4f 7/2 peak (positioned at 84.0 eV).

2.2 Contact angles

Contact angles of water on GO, rGO and GO-PL were measured by the static sessile drop method using a digidrop GBX Model DS. At least 6 drops were measured for each condition. The droplets used for measurement had a volume of 1 μL.