Electronic Supporting Information for

Fluorinated Polyhedral Oligomeric Silsesquioxane

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1. Instrumentation

$^1$H, $^{13}$C NMR, $^{29}$Si nuclear magnetic resonance (NMR) spectra were recorded on a Bruker DRX 400 MHz spectrometer in CDCl$_3$ at room temperature. Spectrometer operating frequencies were 400.13 MHz ($^1$H), 100.61 MHz ($^{13}$C), and 79.46 MHz ($^{29}$Si). Tetramethylsilane was used as an internal standard for $^1$H, $^{13}$C, and external standard for $^{29}$Si NMR spectra. $^{19}$F NMR spectra (operating frequencies: 276.47 MHz) were recorded on AV400 MHz, and instrument default calibration (CFCl$_3$) was used. Thermogravimetric analysis (TGA) was performed in a Perkin-Elmer thermogravimetric analyzer (TGA 7) in nitrogen or in air at a heating rate of 20 °C/min. Differential scanning calorimetry (DSC) experiments were studied on a TA instrument DSC 2920 under a heating and cooling rate of 10 °C/min in nitrogen. Elemental analysis was conducted on a Perkin-Elmer 240C elemental analyzer for C, H, and S determination at the Chemical and Molecular Analysis Center, Department of Chemistry, National University of Singapore.

Spin coating for water contact angle was conducted on Rame-Hart Contact angle goniometer, with 5 wt.% of FluoroPOSS in PMMA solution (10 mg/mL in CHCl$_3$).

Atomic Force Microscopy (AFM) experiments: FluoroPOSS was dissolved in mr-I PMMA (bought from Micro Resist Technology GmbH) at a concentration of 0.3 mg/mL and 1 mg/mL. The rotation speed during spin coating was set 2000 rpm and last for 30s. Nanotribology experiments were performed by a Nanoscope III scanning probe microscopy (Veeco-Digital Instruments (DI), Santa Barbara). Commercially available V shaped Si$_3$N$_4$ cantilevers (DI) were used. Each cantilever was calibrated after a given experiment by measuring the thermal excitation of the tip to compute its spring constant. Tapping mode AFM scans was performed in air using a non-coated silicon tip with a spring constant of 10 N/m~20N/m (Nanosensors, Wetzlar, Germany). Features on the nanometer scale were imaged on a minimum of three different areas on the sample.
2. NMR spectra

Figure S1: $^1$H NMR of compound 2a in CDCl$_3$ at room temperature.
Figure S2: $^1$H NMR of compound 2b in CDCl$_3$ at room temperature.
Figure S3: $^1$H NMR of compound 2c in CDCl$_3$ at room temperature.
Figure S4: $^1$H NMR of compound 2d in CDCl$_3$ at room temperature.
Figure S5: $^1$H NMR of compound 2e in CDCl$_3$ at room temperature.
Figure S6: $^1$H NMR of compound 3a in CDCl$_3$ at room temperature.
Figure S7: $^1$H NMR of compound 3b in CDCl$_3$ at room temperature.
Figure S8: $^1$H NMR of compound 3c in CDCl$_3$ at room temperature.
Figure S9: $^1$H NMR of compound 3d in CDCl$_3$ at room temperature.
Figure S10: $^1$H NMR of compound 3e in CDCl$_3$ at room temperature.
Figure S11: $^{13}$C NMR of compound 3a in CDCl$_3$ at room temperature.
Figure S12: $^{13}$C NMR of compound 3b in CDCl$_3$ at room temperature.
Figure S13: $^{13}$C NMR of compound $3c$ in CDCl$_3$ at room temperature.
Figure S14: $^{13}$C NMR of compound 3d in CDCl₃ at room temperature.
Figure S15: $^{13}$C NMR of compound 3e in CDCl$_3$ at room temperature.
Figure S16: $^{29}$Si NMR of compound 3a in CDCl$_3$ at room temperature.
Figure S17: $^{29}\text{Si}$ NMR of compound 3b in CDCl$_3$ at room temperature.
Figure S18: $^{29}\text{Si}$ NMR of compound 3e in CDCl$_3$ at room temperature.
Figure S19: $^{29}\text{Si}$ NMR of compound 3d in CDCl$_3$ at room temperature.
Figure S20: $^{29}\text{Si}$ NMR of compound 3e in CDCl$_3$ at room temperature.
Figure S21: $^{19}$F NMR of compound 3a in CDCl$_3$ at room temperature.
Figure S22: $^{19}$F NMR of compound 3b in CDCl$_3$ at room temperature.
Figure S23: $^{19}$F NMR of compound 3c in CDCl$_3$ at room temperature.
Figure S24: $^{19}$F NMR of compound 3d in CDCl$_3$ at room temperature.
Figure S25: $^{19}$F NMR of compound 3e in CDCl$_3$ at room temperature.