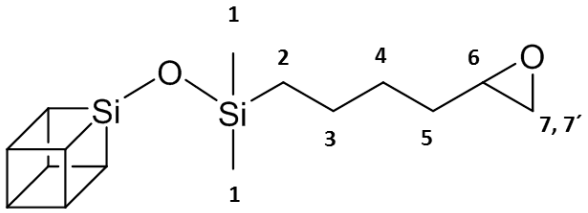
NMR POSS characterization.

POSS-8E: ^{1}H NMR and ^{13}C NMR spectra of 8E-POSS confirm the functionalization of the POSS cage by 8 epoxide ligands, no another species are present. Moreover the total disappearance of the ^{1}H NMR peak at 4.2 ppm corresponding to Si-H bond confirms the complete functionalization of the POSS cage. The ^{29}Si NMR spectrum shows 2 peaks, one at δ = 12.71 ppm corresponding to the M-type silicon with the two methyl groups and the alkyl moiety and a second one at δ - 108.86 ppm corresponding to the Q-type silicon of the POSS core. No cage cleavage occurs and the POSS core is still intact.

^{1}H NMR (CDCl3, ppm): 0.05 (1: Si—CH3), 0.54 (2: Si—CH2), 1.3 – 1.5 (3, 4, 5: CH2—CH2—CH2), 2.38 and 2.68 (7, 7′: O—CH2—CH epoxy), 2.82 (6: O—CH2—CH epoxy).

^{13}C NMR (CDCl3, ppm): 0.0 (1: Si—CH3), 17.9 (2: Si—CH2), 23.1 (3: Si—CH2—CH2), 29.8 (4: Si—CH2—CH2—CH2), 32.5 (5: Si—CH2—CH2—CH2—CH2), 47.4 (7: O—CH2—CH epoxy), 52.5 (6: O—CH2—CH epoxy).

^{29}Si NMR (CDCl3, ppm): -100.86 (Q-type Si, POSS core), 12.71 (M-type Si, E ligands).



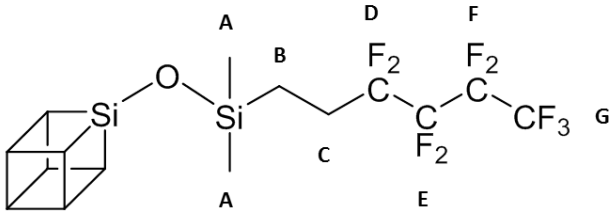
6E2F-POSS:

^{1}H NMR (CDCl3, ppm): -0.00 (1, A: Si—CH3), 0.54 (2: Si—CH2), 0.63 (B: Si—CH2), 1.3 – 1.5 (3, 4, 5: CH2—CH2—CH2), 1.90 (C: Si—CH2—CH2—CF2), 2.38 and 2.68 (7, 7′: O—CH2—CH epoxy), 2.82 (6: O—CH2—CH epoxy).

^{13}C NMR (CDCl3, ppm): -0.00 (1, A: Si—CH3), 7.93 (B: Si—CH2), 17.9 (2: Si—CH2), 23.1 (3: Si—CH2—CH2), 25.84 (C: Si—CH2—CH2—CF2), 29.8 (4: Si—CH2—CH2—CH2), 32.5 (5: Si—CH2—CH2—CH2—CH2), 47.4 (7: O—CH2—CH epoxy), 52.5 (6: O—CH2—CH epoxy).

^{19}F NMR (CDCl3, ppm): -81.31 (G: CF3—CF2), -116.44 (F: CF3—CF2), -124.35 (E: CF3—CF2—CF2), -126.28 (D: CF3—CF2—CF2—CF2).

^{29}Si NMR (CDCl3, ppm): -110.81 (Q-type Si, POSS core), 12.71 (M-type Si, E ligands), 13.44 (M-type Si, F ligands).



4E2F2Φ-POSS:

^{1}H NMR (CDCl3, ppm): -0.00 (1, A, a, a1: Si—CH3), 0.54 (2: Si—CH2), 0.63 (B: Si—CH2), 0.83 (b: Si—CH2), 1.27 (c1: Si—CH2—CH3), 1.3 – 1.5 (3, 4, 5: CH2—CH2—CH2), 1.90 (C: Si—CH2—CH2—CF2), 2.10 (b1: Si—CH2—CH3), 2.38 and 2.68 (7, 7′: O—CH2—CH epoxy), 2.53 (c: Si—CH2—CH2), 2.82 (6: O—CH2—CH epoxy), 6.93 – 7.09 (d, e, f: multiplet Phenyl).

^{13}C NMR (CDCl3, ppm): -0.00 (1, A, a, a1: Si—CH3), 7.93 (B: Si—CH2), 14.51 (c1: Si—CH2—CH3), 17.9 (2: Si—CH2), 19.60 (b: Si—CH2), 23.1 (3: Si—CH2—CH2), 25.84 (C: Si—CH2—CH2—CF2), 29.37 (c: Si—CH2—CH2), 29.8 (4: Si—CH2—CH2—CH2), 31.15 (b1: Si—CH2—CH3), 32.5 (5: Si—CH2—CH2—CH2—CH2), 47.4 (7: O—CH2—CH epoxy), 52.5 (6: O—CH2—CH epoxy), 124.90 – 145.01 (d, e, f: Phenyl).

^{19}F NMR (CDCl3, ppm): -81.31 (G: CF3—CF2), -116.44 (F: CF3—CF2), -124.35 (E: CF3—CF2—CF2), -126.28 (D: CF3—CF2—CF2—CF2).

^{29}Si NMR (CDCl3, ppm): -108.77 (Q-type Si, POSS core), 10.67 (M-type Si, Φ ligands), 12.54 (M-type Si, Φ_1 ligands), 12.71 (M-type Si, E ligands), 13.44 (M-type Si, F ligands).