Electronic Supplementary Material (ESI) for Nanoscale.

Reduced graphene oxide - silsesquioxane hybrid as novel supercapacitor electrode

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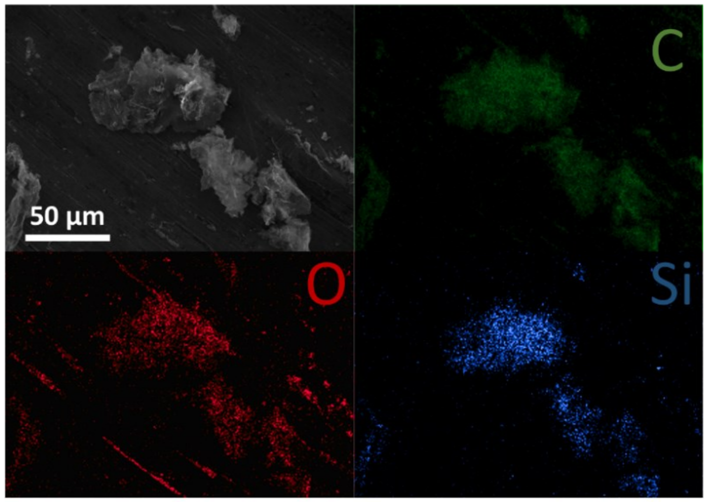

Fig. S1 Scanning Electron Microscopy (SEM) pictures of rGO-POSS.

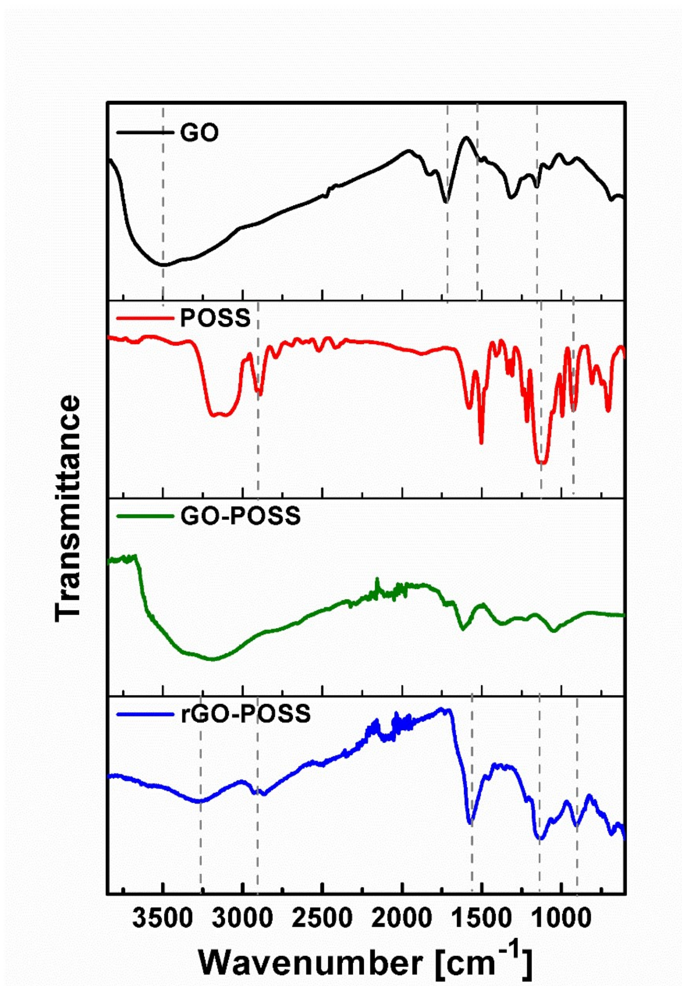

Fig. S2 FT-IR spectra of graphene oxide (black curve), POSS (red), GO-POSS (green) rGO-POSS composite (blue).

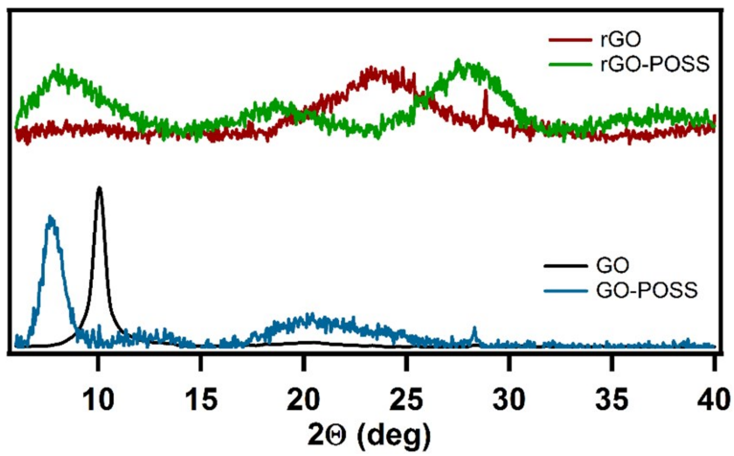

Fig. S3 X-ray diffraction spectra of graphene oxide (GO), chemically reduced graphene oxide (rGO), and its composites with silsesquioxane (GO-POSS, rGO-POSS).

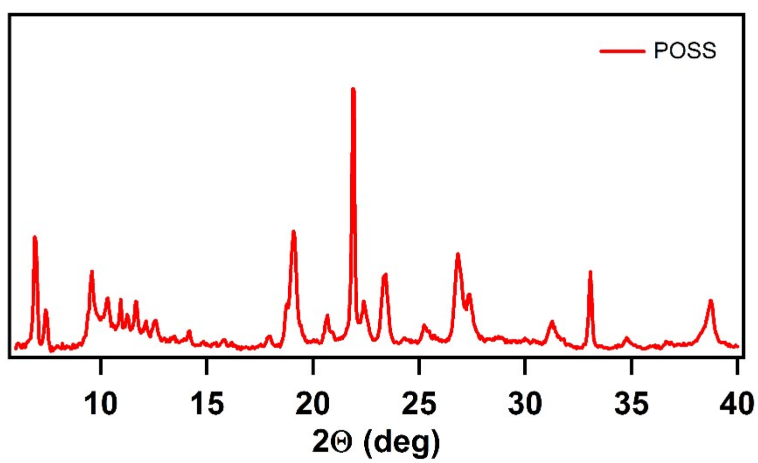

Fig. S4 X-ray diffraction spectra of POSS.

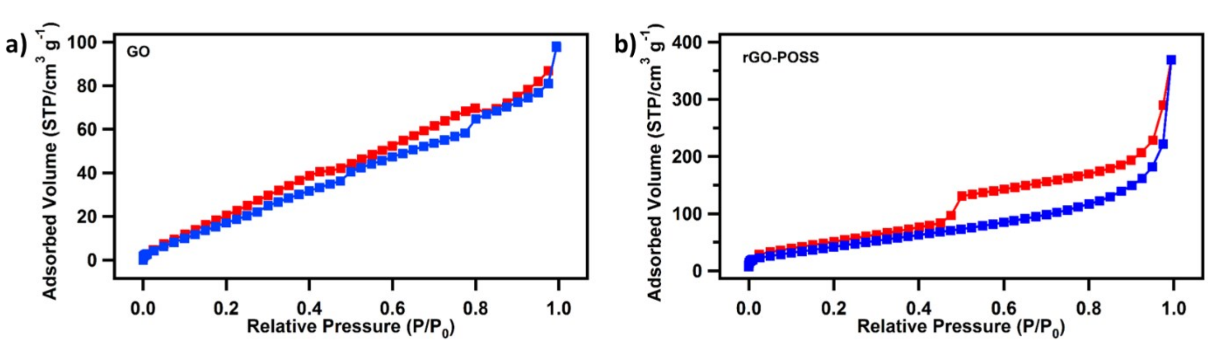

Fig. S5 Adsorption-desorption N_2 isotherm for a) graphene oxide (GO) b) rGO-POSS composite.

Tab. S1 BET surface area analysis of GO, POSS, rGO and rGO-POSS.

	BET Surface area (m^2g^{-1})	Pore volume (cm^3 g^{-1})	Average pore size (nm)
GO	108	0.15	5.6
POSS	13	0.025	3.3
rGO	9	0.018	1.5
rGO-POSS	180	0.54	4

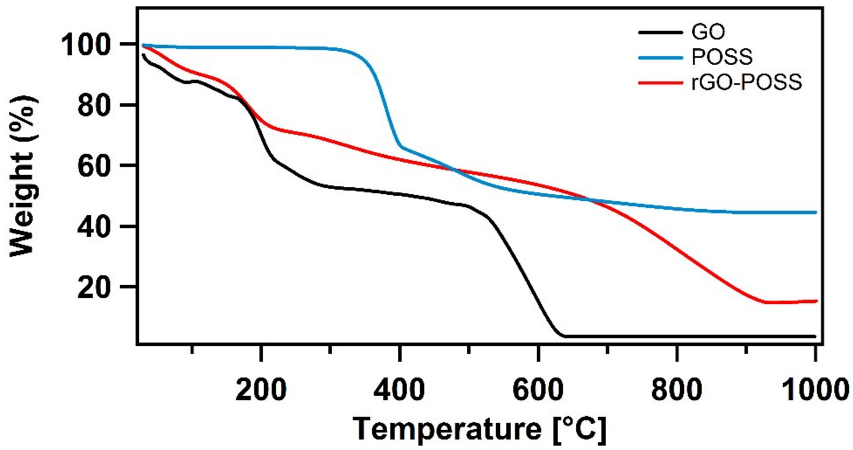

Fig. S6 Thermogravimetric analysis of GO, POSS and rGO-POSS.

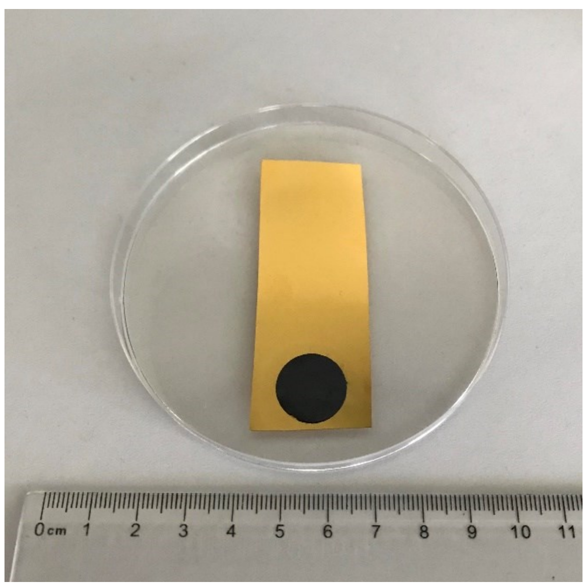

Fig. S7 rGO-POSS electrode deposited on Au-covered polyethylene terephthalate (PET).

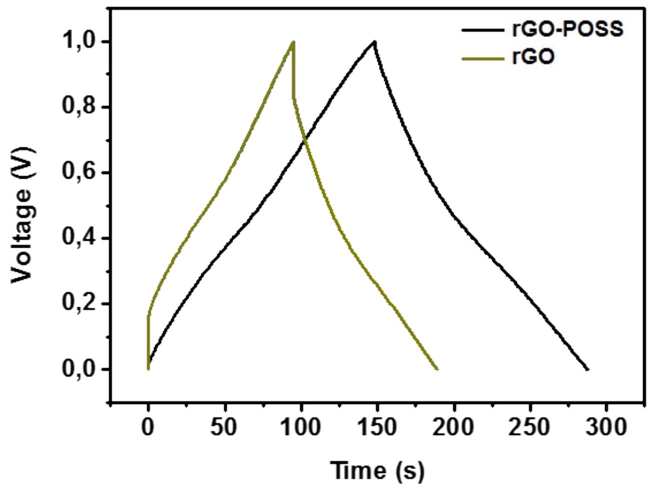

Fig. S8 Charge-discharge curves for rGO-POSS and rGO at current density of 1 A g^{-1}.

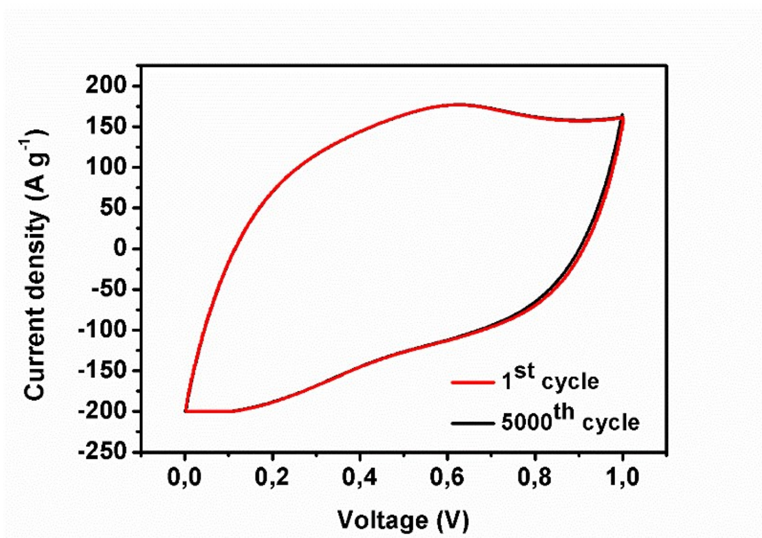

Fig. S9 CV curves showing cyclability of rGO-POSS electrode after 5000 cycles at scan rate of 100 mV s^{-1}.

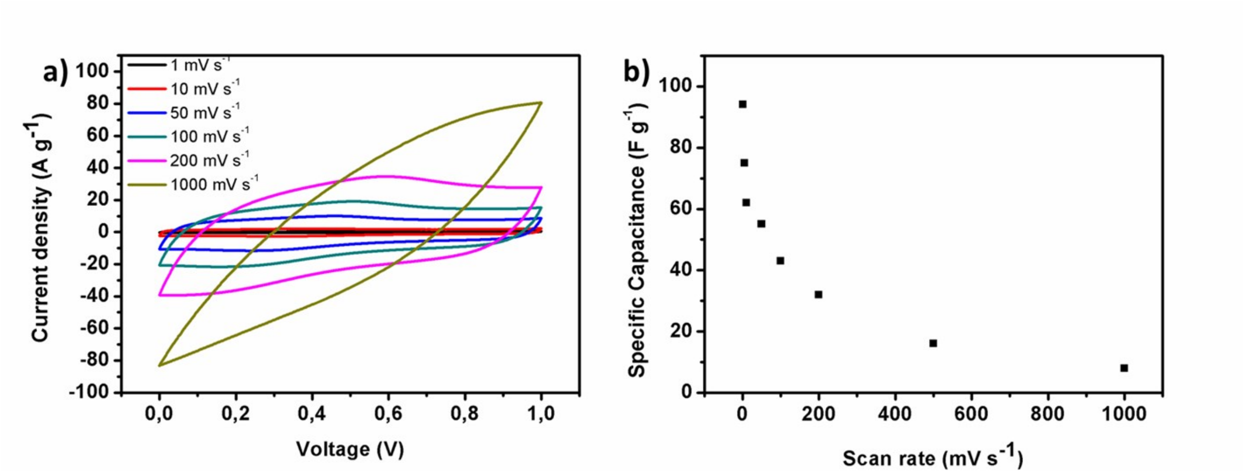

Fig. S10 Electrochemical measurements for hydrazine-reduced graphene oxide used as reference material a) circular voltammetry curves in the range of 1-1000 mV s^{-1} b) specific capacitance at different scan rates for hydrazine-reduced graphene oxide.

Tab. S2 Comparison of most common characteristics of reduced graphene-based electrodes.

Material	Electrolyte	Scan Rate/ current density	Specific Capacitance	Cycle no. (retention)	Ref.
rGO	2M KOH	2 mV s^{-1}	44 F g^{-1}	-	1
rGO	1M H_2SO_4	1 mA cm^{-2}	areal: 33.8 mF cm^{-2}	-	2
rGO	2M H_2SO_4	0.2 A g^{-1}	141 F g^{-1}	-	3
rGO	PVA-H_2SO_4	1.1 A g^{-1}	171 F g^{-1}	100000(80%)	4
rGO-powder rGO-paper	6M KOH	0.5 A g^{-1}	255 F g^{-1} 196 F g^{-1}	1200 (~93%) 1200 (~94%)	5
rGO	1M Na_2SO_4	50 mA g^{-1}	67 F g^{-1}	-	6
rGO-MnO_2	1M Na_2SO_4	50 mA g^{-1}	897 mF cm^{-2}	6450 (83%)	6
rGO-biochar	0.5 M H_2SO_4	0.5 A g^{-1}	167 F g^{-1}	10000 (90%)	7
Ap-rGO	6M KOH	5 mV s^{-1}	160 F g^{-1}	5000 (80%)	8
TiO_2-rGO	1M $LiPF_6$	0.4 A g^{-1}	150 F g^{-1}	100 (80%)	9
rGO-PVA		1 A g^{-1}	122.7 F g^{-1}	1000 (87.4%)	10
rGO-melamine		1 A g^{-1}	101 F g^{-1}	-	10
rGO-PU		1 A g^{-1}	55.56 F g^{-1}	-	10
rGO-POSS	1M H_2SO_4	1 mV s^{-1}	174 F g^{-1} 350 mF cm^{-2} 115 F cm^{-3}	5000 (>98%)	This work

Ap- aminopyrole, PVA- polyvinyl alcohol; PU- polyurethane

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