Oxygen Vacancy-Rich doped CDs@graphite felt-600 Heterostructures for High-performance Supercapacitor Electrodes

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S1 Density functional theory calculation

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First-principle calculations were conducted by density functional theory (DFT). And the general gradient approximationin the Perdew–Burke–Ernzerhof was used to display the exchange–correlation energy. The planewaves cutoff energy of 400 eV was used. The tolerance for structural optimization was reached at 0.05 eVÅ^{-1}. To calculate the binding energies, CDs on GF (9 *9*1 periodic supercell) in two different possible orientations named vertical and parallel were discussed. The translation vector along the z direction was defined as 25 Å.

Table S1 Density of different electrode materials.

electrode materials	ρ (g cm^{-3})	C_1 (F cm^{-2})
graphite felt	0.149	0.018
GA@graphite felt	0.175	0.003
CDs@graphite felt-500	0.157	0.051
CDs@graphite felt-600	0.171	3.34
CDs@graphite felt-700	0.231	2.5

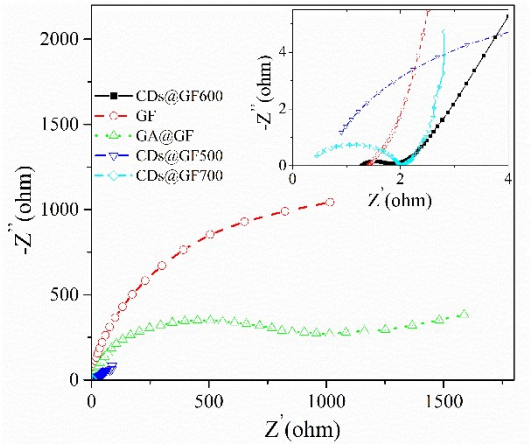

Fig. S1 the corresponding magnification of the high-frequency region of the Fig.6b.

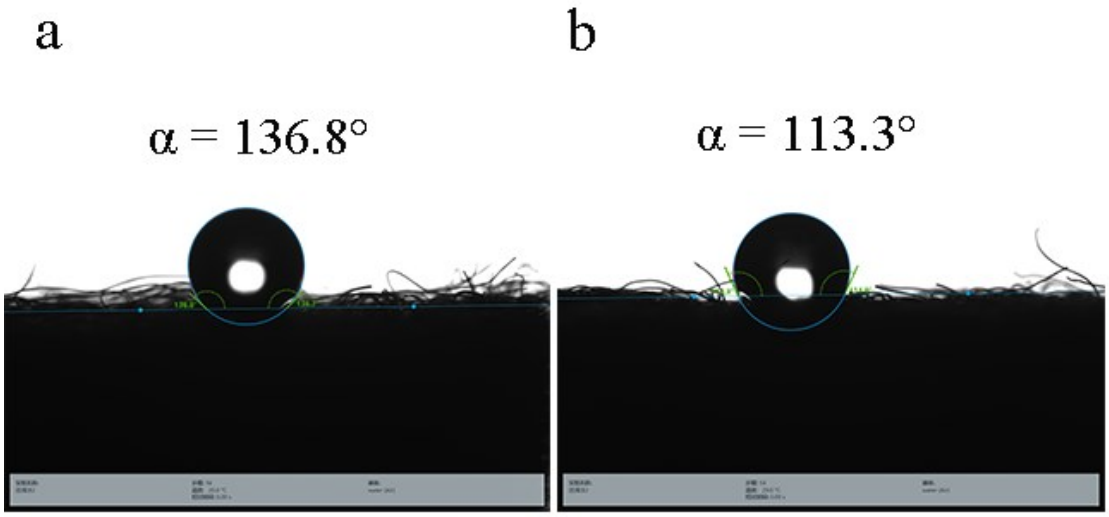

Fig. S2 The contact angle measurements of GF (a) and CDs@GF600 (b).

Table S2 The detailed parameters of the equivalent circuit

electrode	R_s (Ω)	R_{ct} (Ω)	Z_w (Ω)
graphite felt	1.47	2600	0.91
GA@graphite felt	3.67	989.6	0.82
CDs@graphite felt-500	0.68	12.7	0.93
CDs@graphite felt-700	0.30	1.67	0.91
CDs@graphite felt-600	1.18	0.73	0.48
CDs@graphite felt-600 SC Cycle 1st	11.03	14.66	0.22
CDs@graphite felt-600 SC Cycle 7000th	6.85	18.42	0.22

Rs-the equivalent series resistance, which is the high frequency intercept of the semicircle on the real axis; Rct-charge-transfer resistance, which is the diameter of the semicircle. Z_w-the Warbug resistance.