

Ultrafine VN quantum nanodots anchored in three-dimensional porous N-doped carbon with excellent pseudocapacitive behaviour for high rate lithium-ion batteries

Dong Wang,^a Yanfang Gao,^{* a} Zihan Guo,^{* a} and Zhiwei Wang^{a b}

- a. School of Chemical Engineering, Inner Mongolia University of Technology, Hohhot, 010051, P.R. China.
E-mail: yf_gao@imut.edu.cn; gzh@imut.edu.cn
- b. School of Business Administration, Inner Mongolia University of Finance and Economics, Hohhot, 010070, P.R. China.

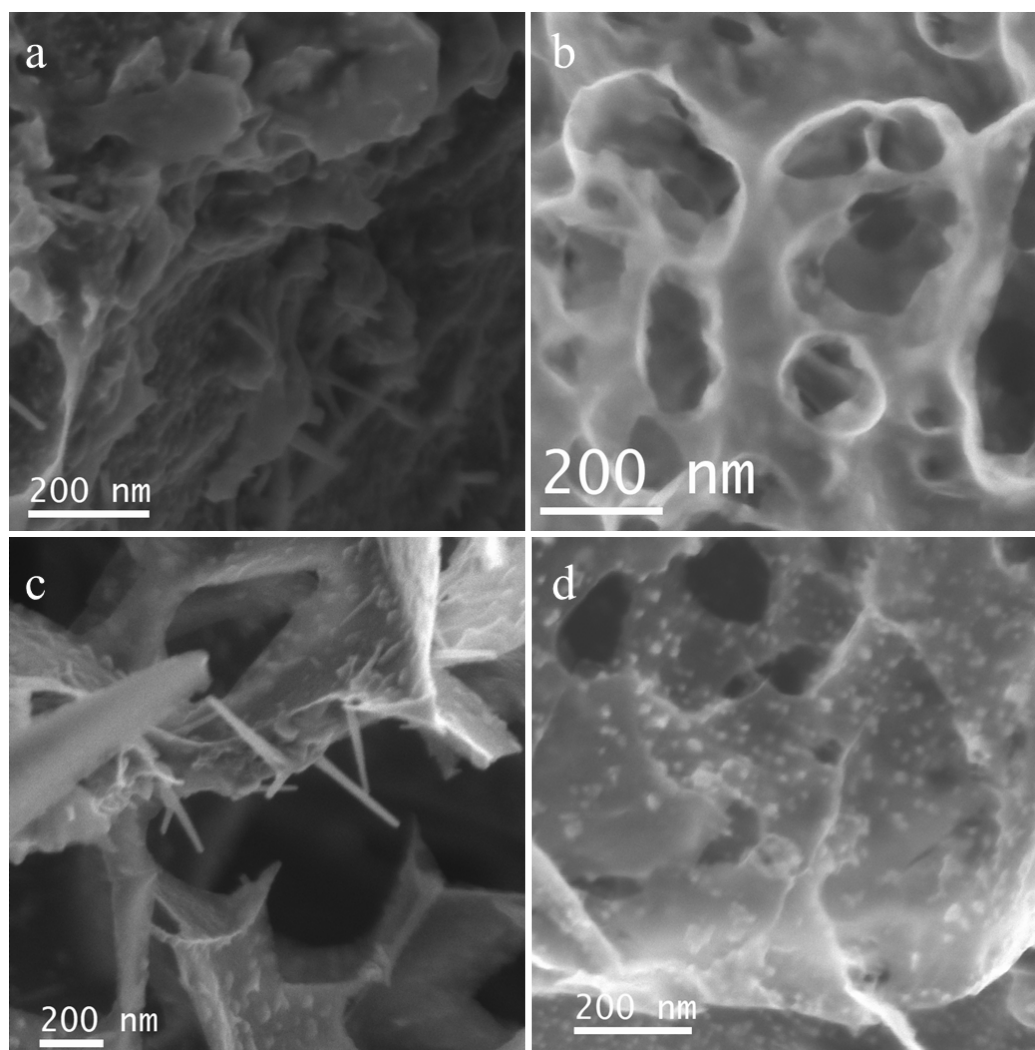


Figure S1 Magnified SEM images of a) VNQDs@PNC-1, b) VNQDs@PNC-2, c) VNQDs@PNC-3, and d) VNQDs@PNC-4.

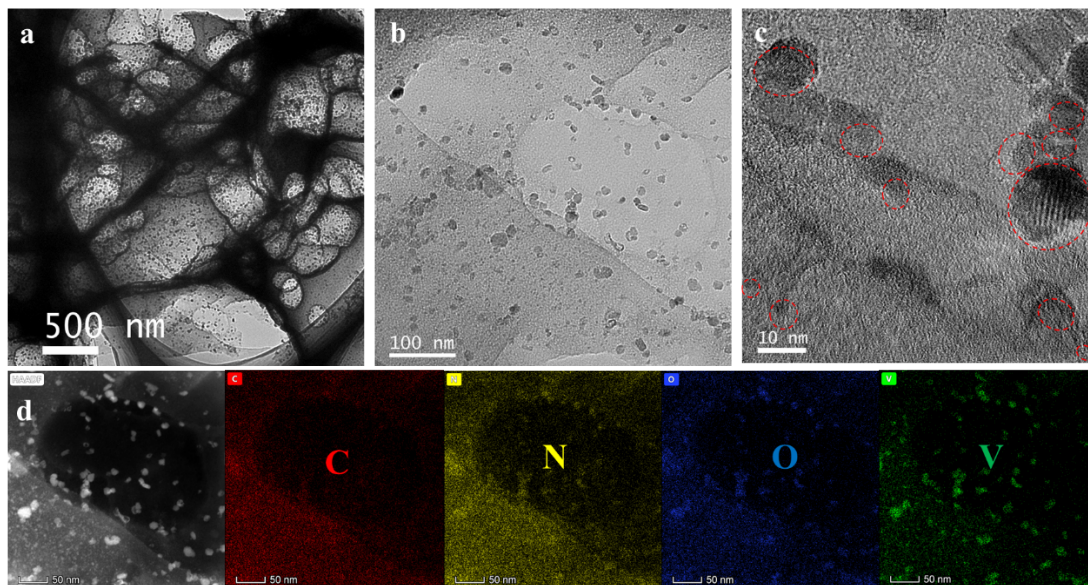


Figure S2 (a, b) TEM images, (c) HRTEM image, and corresponding (d) EDS of VNQDs@PNC-4.

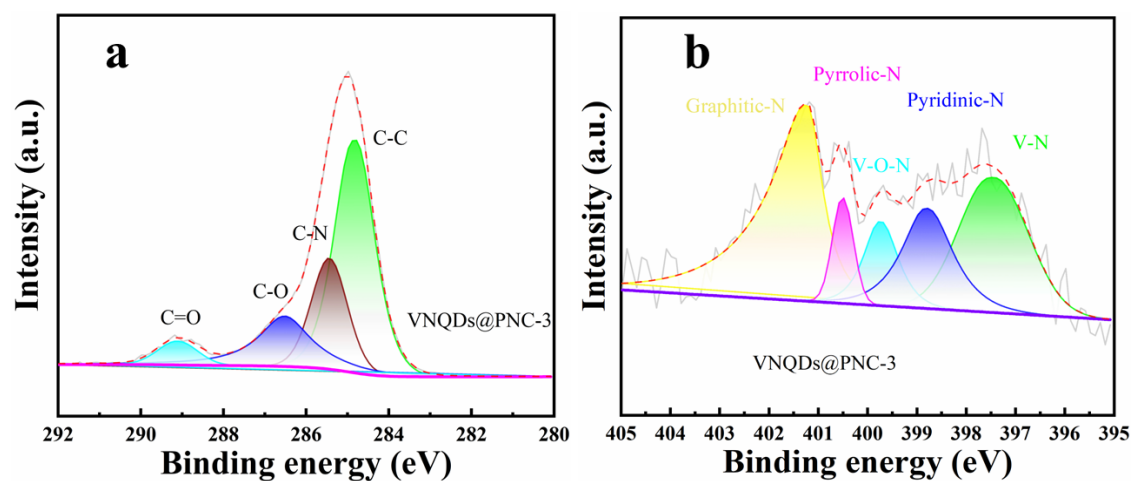


Figure S3 High resolution spectra (a) C1s and (b) N1s of VNQDs@PNC-3.

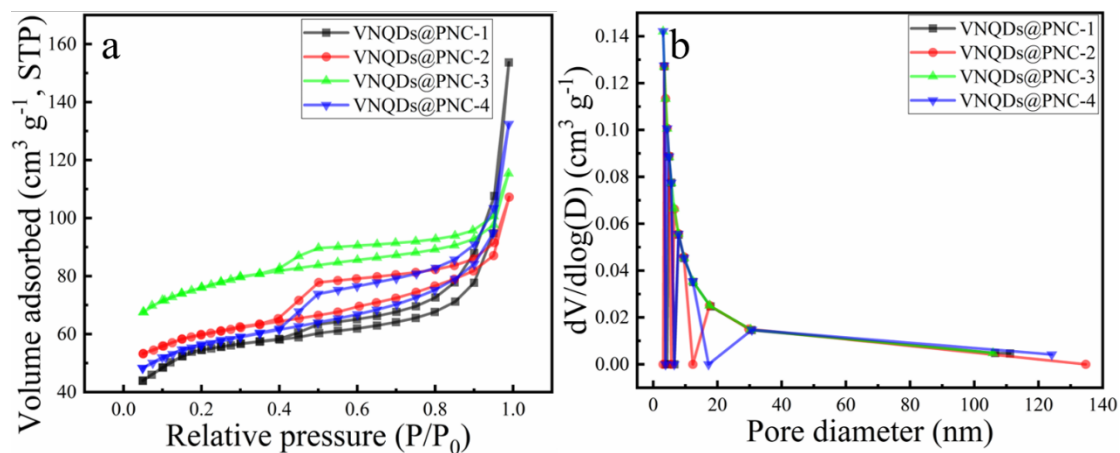


Figure S4 (a) N₂ adsorption-desorption isotherm and (b) Pore size distribution of VNQDs@PNC-1, VNQDs@PNC-2, VNQDs@PNC-3, and VNQDs@PNC-4.

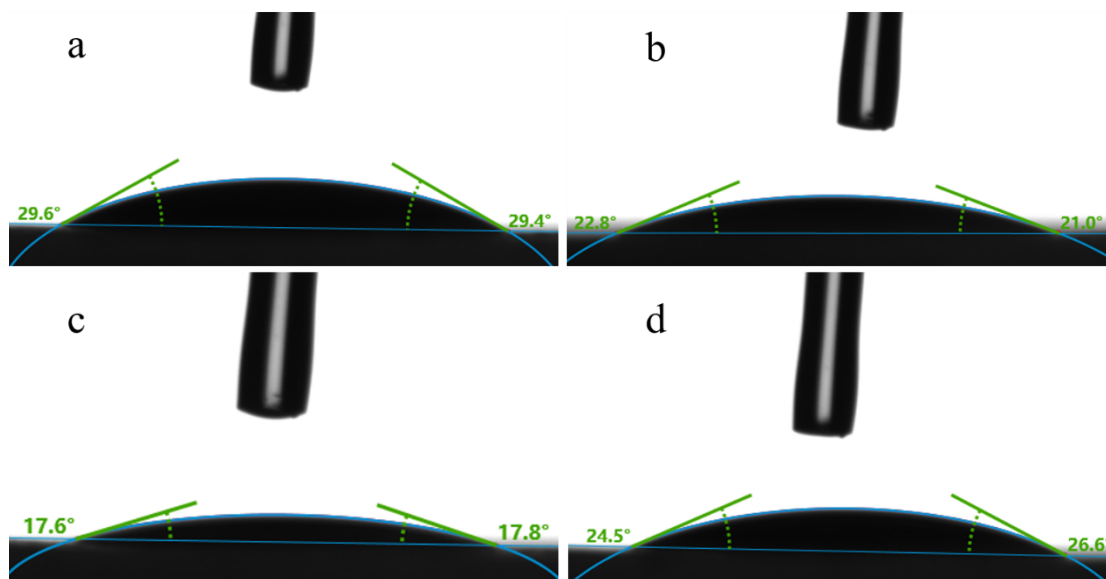


Figure S5 Contact angle of (a) VNQDs@PNC-1, (b) VNQDs@PNC-2, (c) VNQDs@PNC-3, and (d) VNQDs@PNC-4 electrode with an electrolyte droplet for the static state.

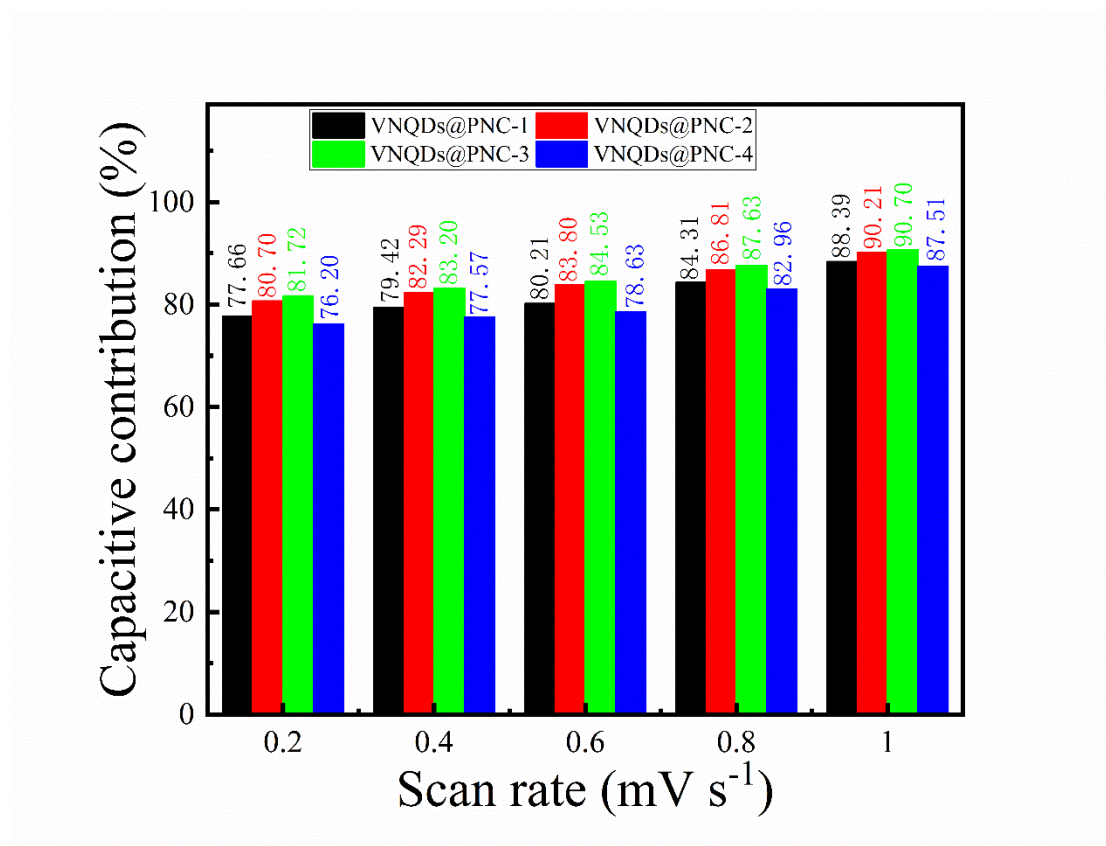


Figure S6 A comparison of the capacitive contribution at different scanning speeds of VNQDs@PNC-1, VNQDs@PNC-2, VNQDs@PNC-3, and VNQDs@PNC-4.

A comparison of capacitive contributions under the different scan rates between DRX-Li₃V₂O₅ anodes from V₂O₅ bulk and nanosheets.

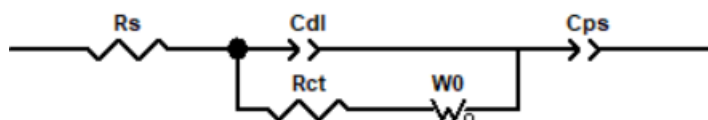


Figure S7 The fitting equivalent circuit model of EIS

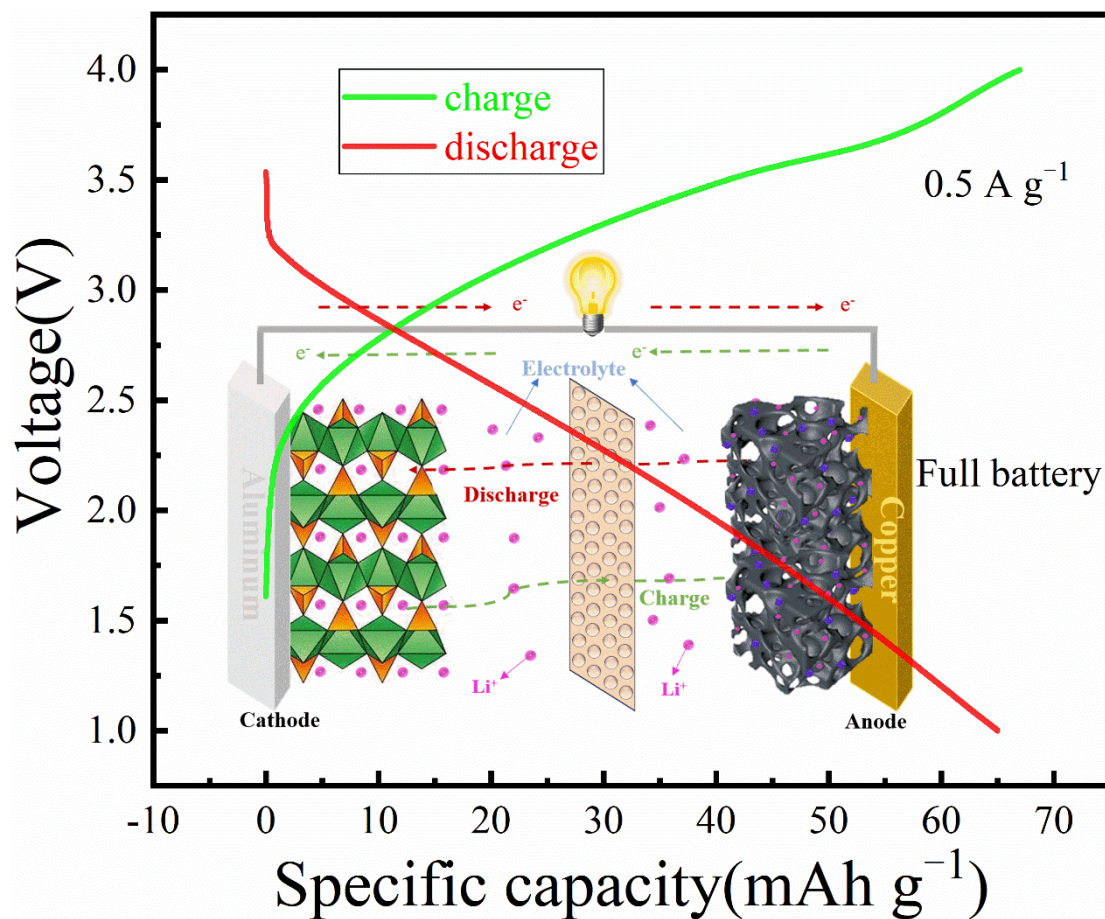


Figure S8 Charge-discharge profiles of VNQDs@NPC-3||LFP LIBs and Schematic illustration LIBs (inset).

Table S1 The VNQDs@PNC-X prepared with different ratios of glucose to urea

Entry	Starting materials				
	Glucose (g)	Urea (g)	NH ₄ VO ₃ (g)	NaCl (g)	H ₂ O (mL)
VNQDs@PNC-1	3	1	1	10	80
VNQDs@PNC-2	2	1	1	10	80
VNQDs@PNC-3	1.5	1	1	10	80
VNQDs@PNC-4	1	1	1	10	80

Table S2 The ratio of ID to IG for the investigated sheets, where ID and IG are the Raman intensities of the D and G peaks

Samples	ID	IG	ID : IG
VNQDs@PNC-1	12077.73	11719.22	0.97
VNQDs@PNC-2	18296.06	18561.40	1.01
VNQDs@PNC-3	12814.03	13210.33	1.03
VNQDs@PNC-4	12909.83	13267.8	1.02

Table S3 The weight percentage of VN in the TGA data

Samples	V ₂ O ₅ (%)	V (%)	VN (%)
VNQDs@PNC-1	48.47	13.58	17.31
VNQDs@PNC-2	59.60	16.69	21.28
VNQDs@PNC-3	60.81	17.03	21.72
VNQDs@PNC-4	62.75	17.57	22.41

Table S4 Resistance elements of four samples derived from the Nyquist plots.

Samples	R _s (Ω)	R _{ct} (Ω)	W _o (Ω)
VNQDs@PNC-1	2.117	280.3	154.3
VNQDs@PNC-2	1.275	228.3	138.1
VNQDs@PNC-3	1.783	137.1	140.9
VNQDs@PNC-4	1.875	179.2	167.8