

Supporting Information (SI) for Publication

Applications of advanced metrology for understanding the effects of drying temperature in lithium-ion battery electrodes manufacturing process

Ye Shui Zhang^{*1,2,3}, Josh J. Bailey^{1,2,4}, Yige Sun^{2,5}, Adam M. Boyce^{1,2}, Will Dawson^{1,2}, Carl D. Reynolds^{2,6}, Zhenyu Zhang^{1,2}, Xuekun Lu^{1,2}, Patrick Grant^{2,5}, Emma Kendrick^{2,6}, Paul R. Shearing^{1,2}, Dan J.L. Brett^{*1,2}

1. Electrochemical Innovation Lab, Department of Chemical Engineering, University College London, London, WC1E 7JE UK

2. The Faraday Institution, Quad One, Harwell Science and Innovation Campus, Didcot, OX11 0RA UK

3. School of Engineering, University of Aberdeen, Aberdeen, AB24 3UE UK

4. School of Mechanical and Aerospace Engineering, Queen's University Belfast, Belfast, BT9 5AH, UK

5. Department of Materials, University of Oxford, Parks Road, Oxford, OX1 3PH UK

6. School of Metallurgy and Materials, University of Birmingham, Birmingham, B15 2TT UK

Corresponding author: d.brett@ucl.ac.uk; yeshuizhang@ucl.ac.uk

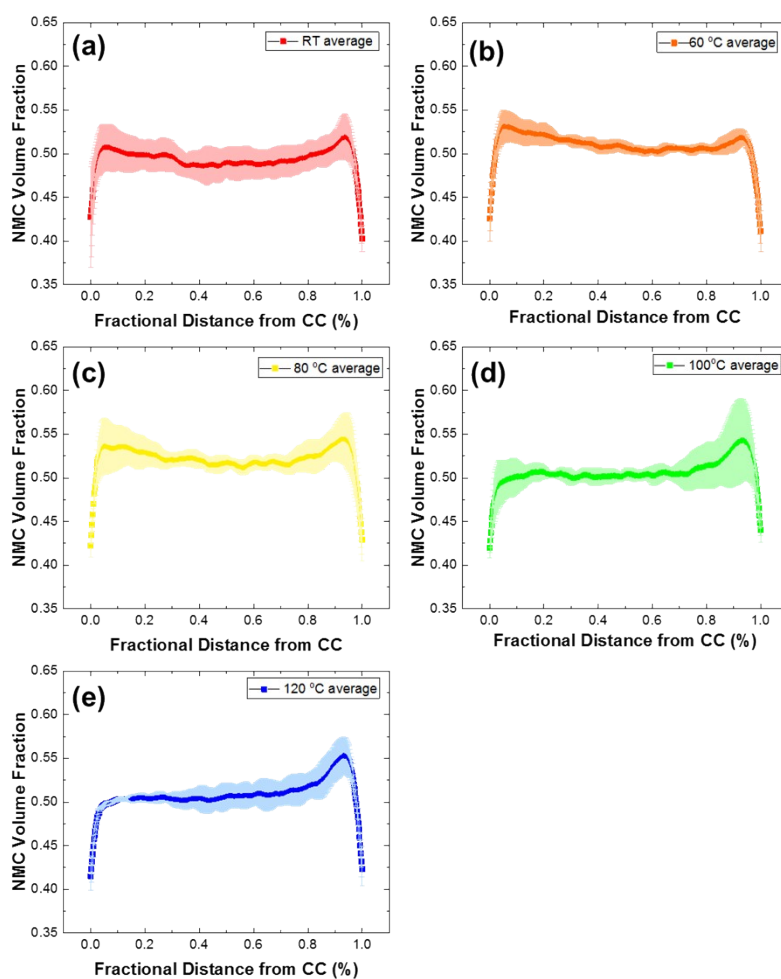


Figure S1 Areal fraction of graphite as a function of distance from the CC for anodes dried at (a) RT, (c) 60 °C, (e) 80 °C, (g) 100 °C and (i) 120 °C.

Table S1 Adhesion force test at 180° - peel-off force at 10 mm s⁻¹ for cathodes dried at RT, 60, 80, 100 and 120 °C;

Adhesion force	RT (N)	60 °C (N)	80 °C (N)	100 °C (N)	120 °C (N)
Sample 1	0.35	0.15	0.072	0.14	0.14
Sample 2	0.40	0.16	0.067	0.084	0.11
Sample 3	0.38	0.044	0.11	0.10	0.11
Sample 4	0.36	0.045	0.14	0.12	0.11
Sample 5	0.43	0.047	0.067	0.12	0.16
Sample 6	N/a	0.012	0.051	0.13	0.14
AVERAGE (N)	0.39	0.076	0.085	0.12	0.13
STDEV (N)	0.030	0.061	0.035	0.021	0.021
AVERAGE (N mm⁻¹)	0.015	0.0030	0.0034	0.0046	0.0051
STDEV (N mm⁻¹)	0.0012	0.0025	0.0014	0.00086	0.00084

Table S2 Adhesion force test at 180° - peel-off force at 10 mm s⁻¹ for anodes dried at RT, 60, 80, 100 and 120 °C;

Adhesion force	RT (N)	60 °C (N)	80 °C (N)	100 °C (N)	120 °C (N)
Sample 1	0.07	0.052	0.062	0.071	0.039
Sample 2	0.046	0.096	0.056	0.059	0.040
Sample 3	0.052	0.044	0.052	0.050	0.037
Sample 4	0.049	0.044	0.055	0.046	0.041
Sample 5	0.041	0.046	0.063	0.054	0.035
Sample 6	0.049	0.047	0.066	0.054	0.038
AVERAGE (N)	0.047	0.047	0.059	0.057	0.038
STDEV (N)	0.0042	0.0032	0.0054	0.0079	0.0021
AVERAGE (N mm⁻¹)	0.0019	0.0019	0.0024	0.0023	0.0015
STDEV (N mm⁻¹)	0.00017	0.00013	0.00022	0.00032	8.33E-05

Table S3 Specific capacity at different C-rates (C/10, C/5, C/3, C, 2C and 3C) of cathodes dried at different temperatures (RT, 60, 80, 100 and 120 °C).

Unit	State	Rate	Cathode-RT	Cathode-60 °C	Cathode-80 °C	Cathode-100 °C	Cathode-120 °C
mAh g ⁻¹	Charge	C/10	154.43	130.87	145.65	146.55	147.94
mAh g ⁻¹	Discharge	C/10	150.06	131.76	142.58	143.36	144.59
mAh g ⁻¹	Charge	C/10	150.77	133.06	143.10	143.99	145.86
mAh g ⁻¹	Discharge	C/5	144.98	127.57	137.78	137.77	138.68
mAh g ⁻¹	Charge	C/10	145.22	128.13	137.53	137.38	138.29
mAh g ⁻¹	Discharge	C/3	140.21	121.71	131.94	131.31	130.25
mAh g ⁻¹	Charge	C/10	140.32	121.74	131.57	131.16	130.15
mAh g ⁻¹	Discharge	C	122.08	83.16	98.93	104.49	108.18
mAh g ⁻¹	Charge	C/10	122.18	83.46	98.91	104.65	108.55
mAh g ⁻¹	Discharge	2C	81.83	15.10	39.44	54.98	61.68
mAh g ⁻¹	Charge	C/10	83.10	15.79	39.67	55.28	62.13
mAh g ⁻¹	Discharge	3C	17.70	1.34	7.44	15.24	14.79

Table S4 Specific capacity at different C-rates (C/10, C/5, C/3, C, 2C and 3C) of anodes dried at different temperatures (RT, 60, 80, 100 and 120 °C).

Unit	State	Rate	Anode-RT	Anode-60 °C	Anode-80 °C	Anode-100 °C	Anode-120 °C
mAh g ⁻¹	Charge	C/10	242.43	236.95	220.61	222.85	223.26
mAh g ⁻¹	Discharge	C/10	203.65	207.32	203.19	213.30	199.92
mAh g ⁻¹	Charge	C/10	201.68	207.79	206.76	215.56	202.07
mAh g ⁻¹	Discharge	C/5	129.02	134.44	129.69	148.41	129.85
mAh g ⁻¹	Charge	C/10	128.05	134.18	128.65	147.29	128.74
mAh g ⁻¹	Discharge	C/3	70.35	71.81	67.69	84.93	64.96
mAh g ⁻¹	Charge	C/10	70.24	71.83	67.51	84.64	64.87
mAh g ⁻¹	Discharge	C	28.05	32.51	25.32	31.68	21.82
mAh g ⁻¹	Charge	C/10	26.95	29.17	25.86	31.55	22.70
mAh g ⁻¹	Discharge	2C	9.02	13.90	12.45	14.56	6.81
mAh g ⁻¹	Charge	C/10	9.82	13.66	12.60	14.84	7.59
mAh g ⁻¹	Discharge	3C	3.78	7.45	6.25	2.11	1.10

Table S5 Areal mass loading and areal capacity at discharge stage with C-rate at C/10 for anodes and cathodes dried at RT, 60, 80, 100, and 120 °C.

Cell ID	Areal loading (g cm ⁻²)	Areal capacity (mAh cm ⁻²)
Anode-RT	0.0322	1.6373
Anode-60 °C	0.0220	1.1391
Anode-80 °C	0.0363	1.8425
Anode-100 °C	0.0256	1.3682
Anode-120 °C	0.0299	1.4933
Cathode-RT	0.0207	3.1870
Cathode-60 °C	0.0220	2.8300
Cathode-80 °C	0.0224	3.2203
Cathode-100 °C	0.0216	3.1102
Cathode-120 °C	0.0216	3.0875