

Supplementary material

Improving the cycling stability of SnO₂-graphite electrodes

Yuri Surace^a, Fabian Jeschull^a, Tiphaine Schott^a, Simone Zuercher^b, Michael E. Spahr^b,
Sigita Trabesinger*^a

*^aElectrochemical Energy Storage Section, Electrochemistry Laboratory,
Paul Scherrer Institute, CH-5232 Villigen PSI, Switzerland*

^bImerys Graphite & Carbon, Strada Industriale 12, CH-6743 Bodio, Switzerland

* To whom correspondence should be addressed
(e-mail:sigita.trabesinger@psi.ch; Tel: +41 56 310 5775).

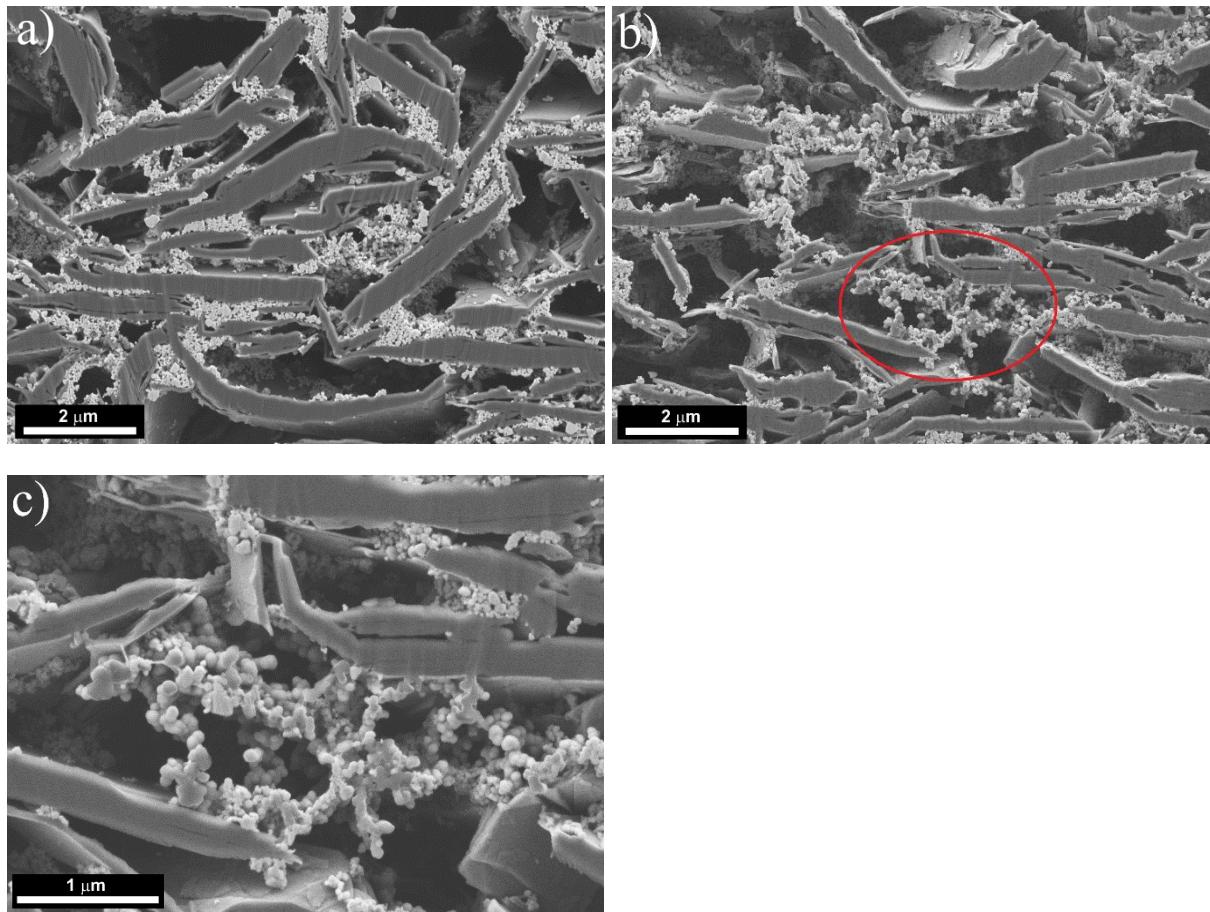


Fig.S1: Micrographs of a) 50SnO₂:45KS6L/2PAA:2CMC and b) 50SnO₂:41KS6L/4PAA:4CMC electrodes cross-section, c) high magnification micrograph of 50SnO₂:41KS6L/4PAA:4CMC electrode cross-section.

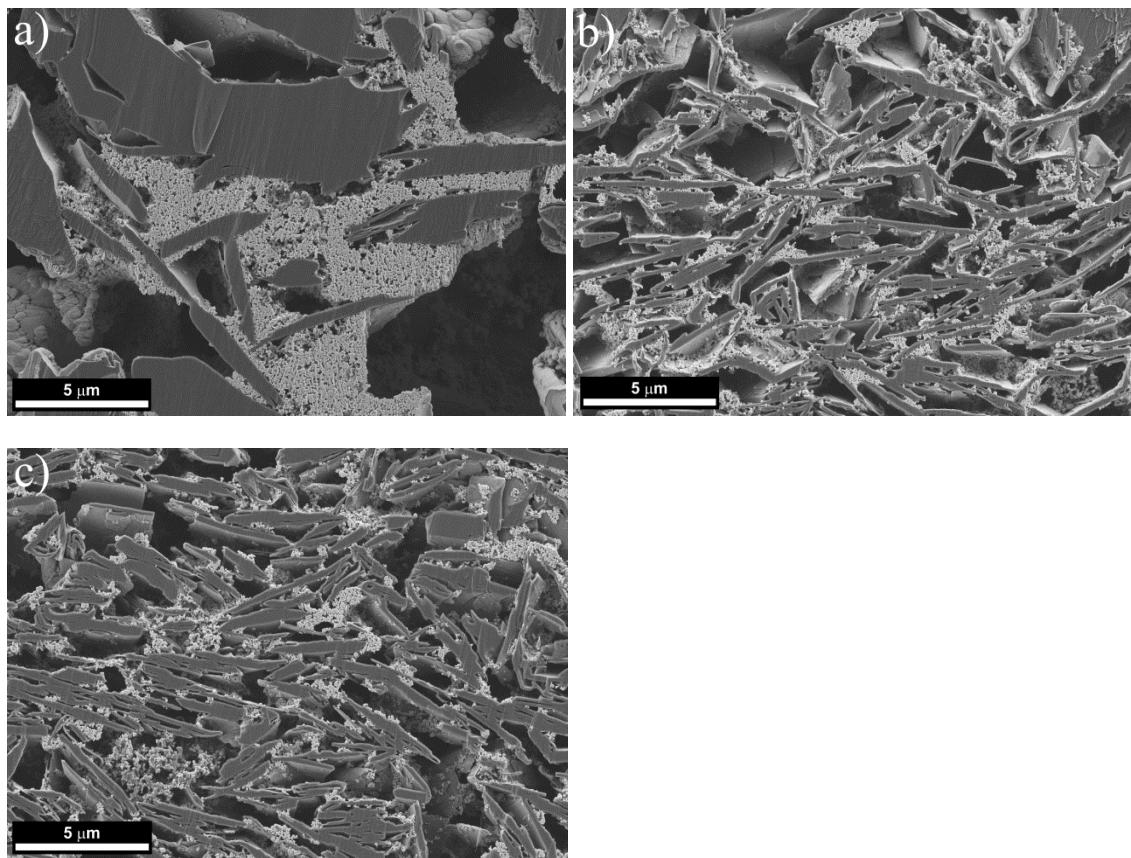


Fig.S2: Micrographs of a) 50SnO₂:45Act1/2PAA:2CMC b) 50SnO₂:45SFG6L/2PAA:2CMC, c) 50SnO₂:45SLP6/2PAA:2CMC electrodes cross-section.

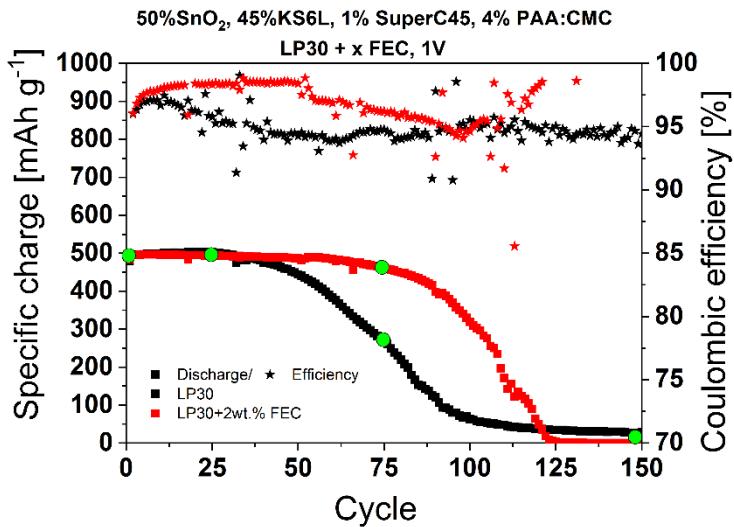
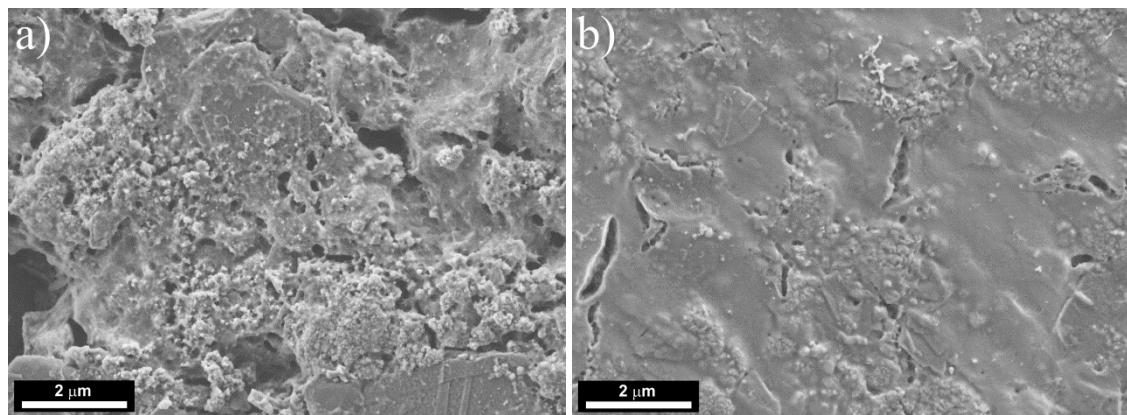
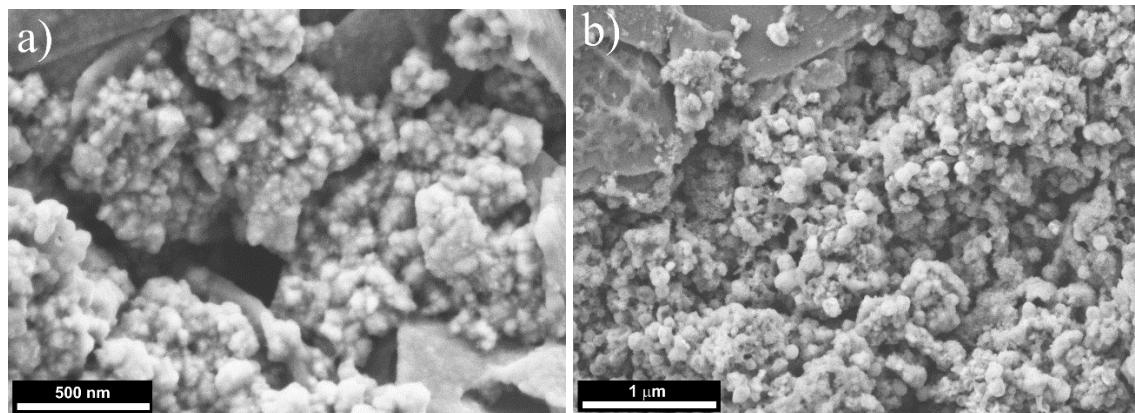


Fig.S3: Electrochemical performance of 50SnO₂:45KS6L/2PAA:2CMC cycled with LP30 (black) and LP30 + 2 wt.% FEC (red). The green dots indicate where the cells were stopped to perform the post-mortem analysis.



FigS4: Micrographs of 50SnO₂:45KS6L/2PAA:2CMC electrode cycled with LP30 electrolyte. (a) after 25 cycles, b) after 75 cycles.



FigS5: a) High magnification micrograph of 50SnO₂:45KS6L/2PAA:2CMC electrode cycled with LP30 + 2 wt.% FEC electrolyte after 25 cycles, b) High magnification micrograph of 50SnO₂:45KS6L/2PAA:2CMC electrode cycled with LP30 + 2 wt.% FEC electrolyte after 75 cycles.

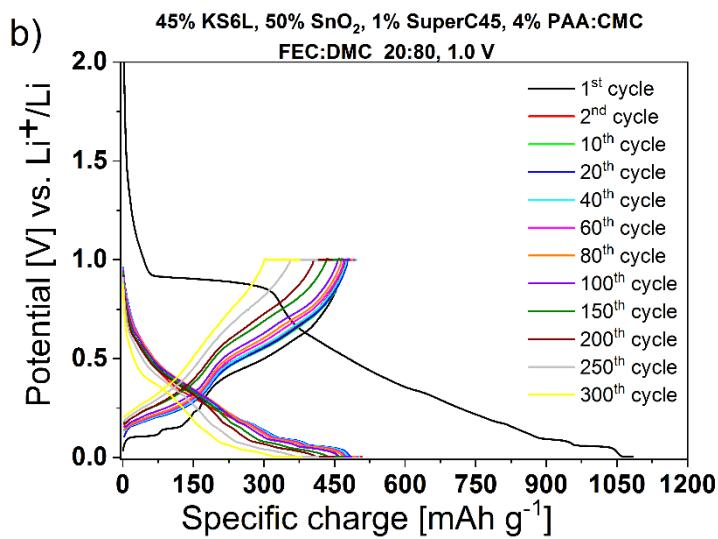
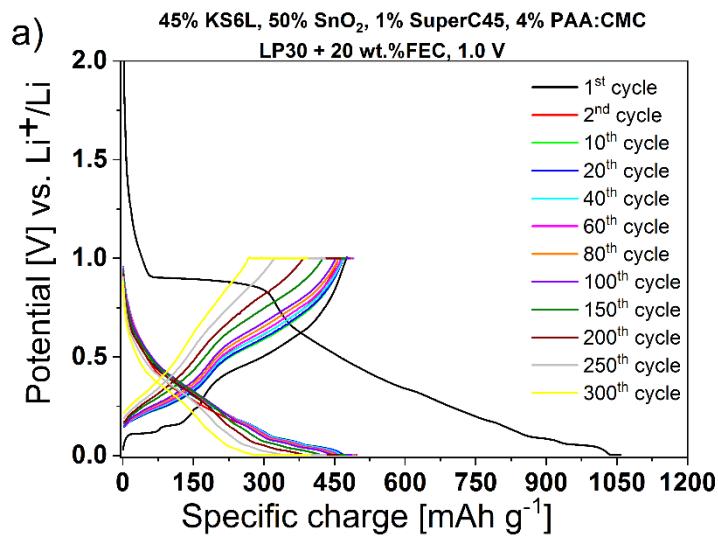


Fig.S6: Potential profile of 50SnO₂:45KS6L/2PAA:2CMC electrodes cycled with (a) LP30 + 20 wt.% FEC and (b) FEC:DMC 20:80.

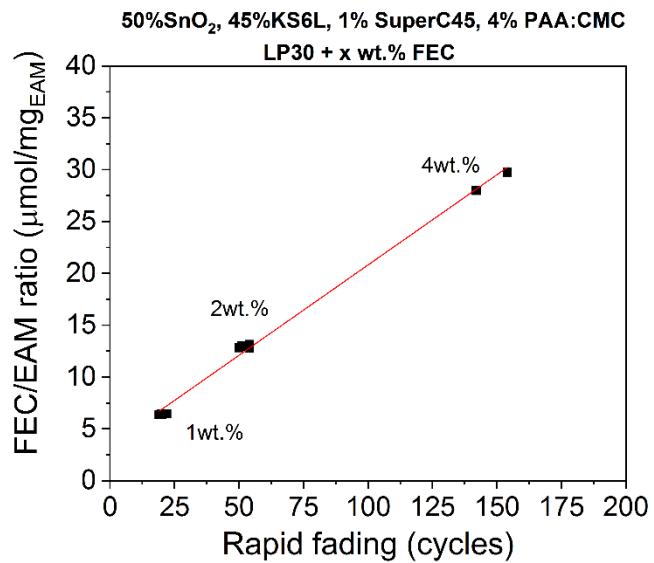


Fig.S7: FEC/EAM ratio versus rapid fading plot for 50SnO₂:45KS6L/2PAA:2CMC electrodes cycled with LP30 + 1wt.% FEC, LP30 + 2wt.%FEC and LP30 + 4wt.%FEC.

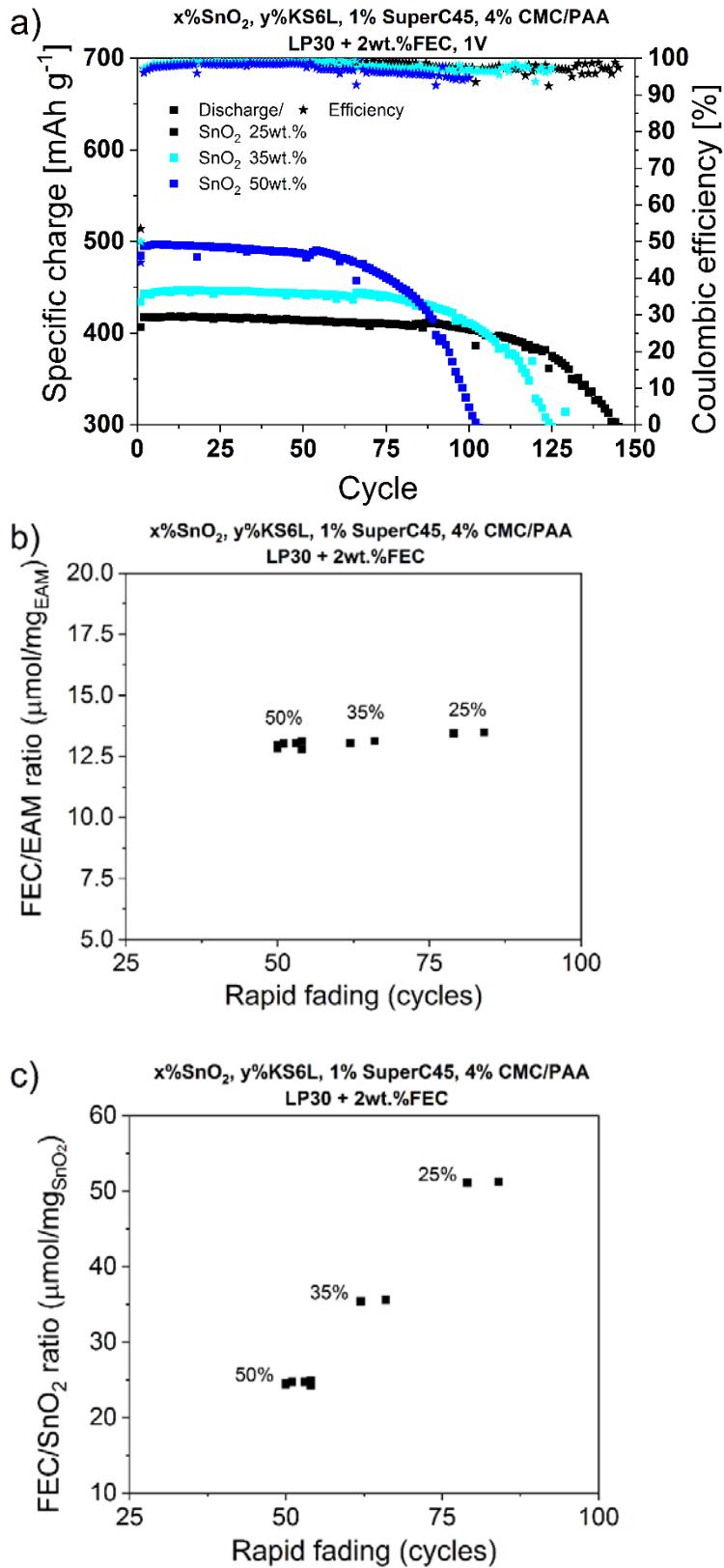


Fig.S8: a) Electrochemical performance of 25SnO₂:70KS6L/2PAA:2CMC, 35SnO₂:50KS6L/2PAA:2CMC and 50SnO₂:45KS6L/2PAA:2CMC electrodes cycled with LP30 + 2wt.% FEC. B) FEC/EAM ratio versus rapid fading c) FEC/SnO₂ ratio versus rapid fading.

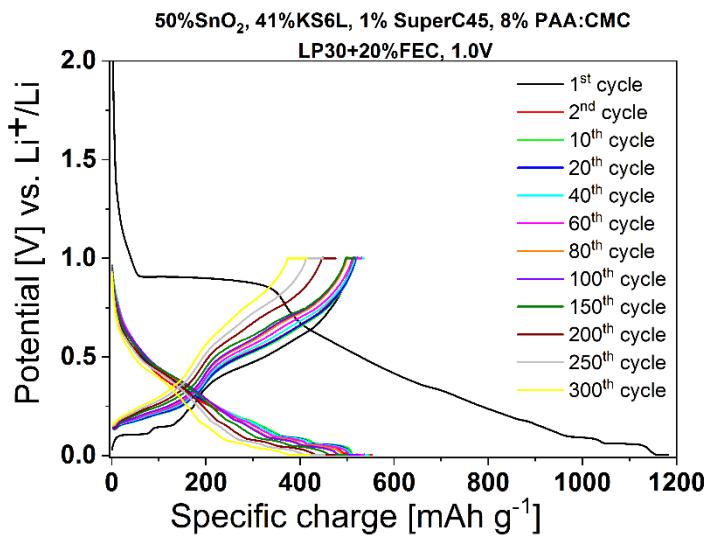


Fig.S9: Potential profile of 50SnO₂:41KS6L/4PAA:4CMC electrodes cycled with LP30 + 20 wt.% FEC.

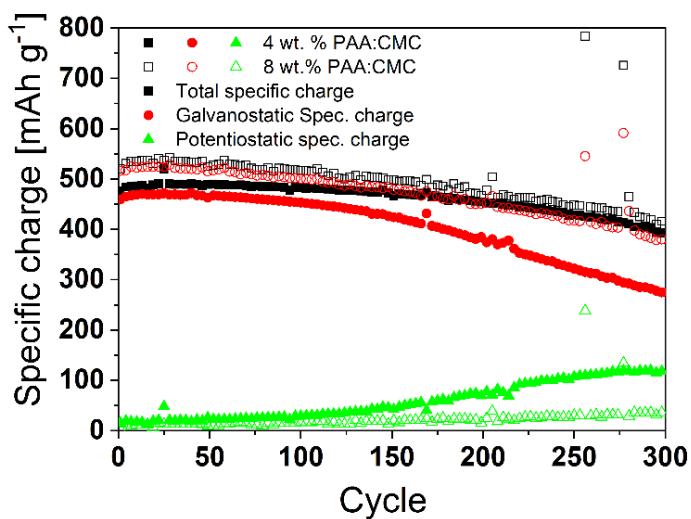


Fig.S10: Specific charge contribution for 50SnO₂:41KS6L/2PAA:2CMC (full symbols) and 50SnO₂:41KS6L/4PAA:4CMC (empty symbols) electrodes cycled with LP30 + 20 wt.% FEC electrolyte using 1.0 V delithiation cut-off potential.

Table S1: Detail of masses, electrolyte amounts, their ratio and rapid fading for the electrodes represented in Fig.S8 and S9.

Electrode	Electrode mass (mg cm ⁻²)	EAM mass (mg cm ⁻²)	SnO ₂ mass (mg cm ⁻²)	Electrolyte	Molar amount FEC (μmol)	Rapid fading (cycles)	FEC/EAM ratio (μmol/mg _{EAM})	FEC/SnO ₂ ratio (μmol/mg _{SnO2})
50SnO ₂ :45 KS6L/2PA A:2CMC	9.97	9.47	4.98	LP30 +1 wt%FEC	61.25	22	6.47	12.29
	10.02	9.51	5.01	/	61.25	20	6.44	12.23
	10.11	9.61	5.06	/	61.25	20	6.38	12.11
	10.11	9.60	5.05	/	61.25	19	6.38	12.12
	9.95	9.45	4.97	LP30 +2 wt%FEC	122.5	52	12.96	24.63
	9.82	9.33	4.91	/	122.5	54	13.13	24.95
	9.90	9.41	4.95	/	122.5	51	13.02	24.74
	9.89	9.40	4.95	/	122.5	53	13.03	24.76
	10.08	9.57	5.04	/	122.5	54	12.80	24.32
	10.06	9.56	5.03	/	122.5	50	12.82	24.35
	9.22	8.76	4.61	LP30 +4 wt%FEC	245	142	27.98	53.17
	8.67	8.24	4.34	/	245	154	29.73	56.49
35SnO ₂ :50 KS6L/2PA A:2CMC	9.89	9.40	3.46	LP30 +2 wt%FEC	122.5	62	13.03	35.39
	9.83	9.34	3.44		122.5	66	13.12	35.61
25SnO ₂ :70 KS6L/2PA A:2CMC	9.56	9.08	2.39	LP30 +2 wt%FEC	122.5	84	13.48	51.26
	9.59	9.11	2.40		122.5	79	13.44	51.11