

Article

## Supplementary Materials: Electrodeposition of Sn and Sn composites with carbon materials using choline chloride-based ionic liquids

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## Nucleation studies

**Figure S1.** Dimensionless plot of  $(i/i_{max})^2$  vs.  $t/t_{max}$  for Sn and composites (chronoamperometry parameters: step potential: -0.550 V).



## • Raman spectra and deconvolution:



Figure S2. Raman spectrum and deconvolution of 0.1M Sn + 0.5 g/L P-MWCNTs ( -1.25 V; 900 s) sample.





Figure S3. Raman spectrum and deconvolution of 0.1M Sn + 0.5 g/L P-MWCNTs ( -1.50 V; 900 s) sample.



**Figure S4.** Raman spectrum and deconvolution of 0.1M Sn + 0.5 g/L P-MWCNTs ( 0.057A/cm2; 900 s) sample.



**Figure S5.** Raman spectrum and deconvolution of 0.01M Sn + 0.5 g/L ox-MWCNTs (-1.25V; 900 s) sample.



**Figure S6.** Raman spectrum and deconvolution of 0.01M Sn + 0.5 g/L ox-MWCNTs (-1.50V; 900 s) sample.



Figure S 7 Raman spectrum and deconvolution of 0.01M Sn + 1 g/L P-MWCNTs (0.0011A/cm2; 900 s) sample.





**Figure S8.** Raman spectrum and deconvolution of 0.01M Sn + 1 g/L P-MWCNTs (0.1142A/cm2; 900 s) sample.



**Figure S9.** Raman spectrum and deconvolution of 0.01M Sn + 1 g/L P-MWCNTs (-1.25V; 900 s) sample.



Figure S10. Raman spectrum and deconvolution of 0.01M Sn + 0.5 g/L rGO (-1.25V; 900 s) sample.



Figure S11. Raman spectrum and deconvolution of 0.01M Sn + 0.5g/L rGO (-1.50V; 900 s) sample.



**Figure S12.** Raman spectrum and deconvolution of 0.01M Sn + 0.5g/L rGO (0.04A/cm2; 900 s) sample.



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Figure S13. Raman spectrum and deconvolution of 0.01M Sn + 1g/L rGO (0.04A/cm2; 900 s) sample.

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Sample	ID/ IG ratio	A <sub>D</sub> / A <sub>G</sub> ratio
Jumpie	532 nm – green	532 nm – green
0.01 M Sn + 0.5 g/L P-MWCNTs	0.21	0.27
(-1.25 V; 900s)		
0.01 M Sn + 0.5 g/L P-MWCNTs	0.08	0.10
(-1.50 V; 900s)		
0.01 M Sn + 0.5 g/L P-MWCNTs	0.04	0.05
(0.057 A/cm <sup>2</sup> ; 900s)		
0.01 M Sn + 0.5 g/L Ox-MWCNTs	0.03	0.02
0.02 (-1.25 V; 900s)	0.05	
0.01 M Sn + 0.5 g/L Ox-MWCNTs	0.08	0.09
(-1.50 V; 900s)	0.00	0:07
0.01 M Sn + 1 g/L P-MWCNTs	0.03	0.06
(0.0011 A/cm <sup>2</sup> ; 300s)		
0.01 M Sn + 1 g/L P-MWCNTs	0.14	0.19
$(0.1142 \text{ A/cm}^2)$		
0.01 M Sn + 1 g/L P-MWCNTs	0.08	0.09
(-1.25 V; 900s)		
0.01 M Sn + 0.5 g/L rGO	0.29	0.65
(-1.25 V; 900s)		
0.01 M Sn + 0.5 g/L rGO	0.98	0.43
(-1.50 V; 900s)		
0.01 M Sn + 0.5 g/L rGO	0.62	1.62
(0.04 A/cm <sup>2</sup> ; 900s)		
0.01 M Sn + 1 g/L rGO	0.23	0.49
(0.04 A/cm <sup>2</sup> ; 900s)		

Table S1. The ID/IG and AD/AG ratios calculated for all samples.



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