

Supporting Information

A Red Phosphorus-Graphite Anode for K-ion Batteries

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1 Cycling stability

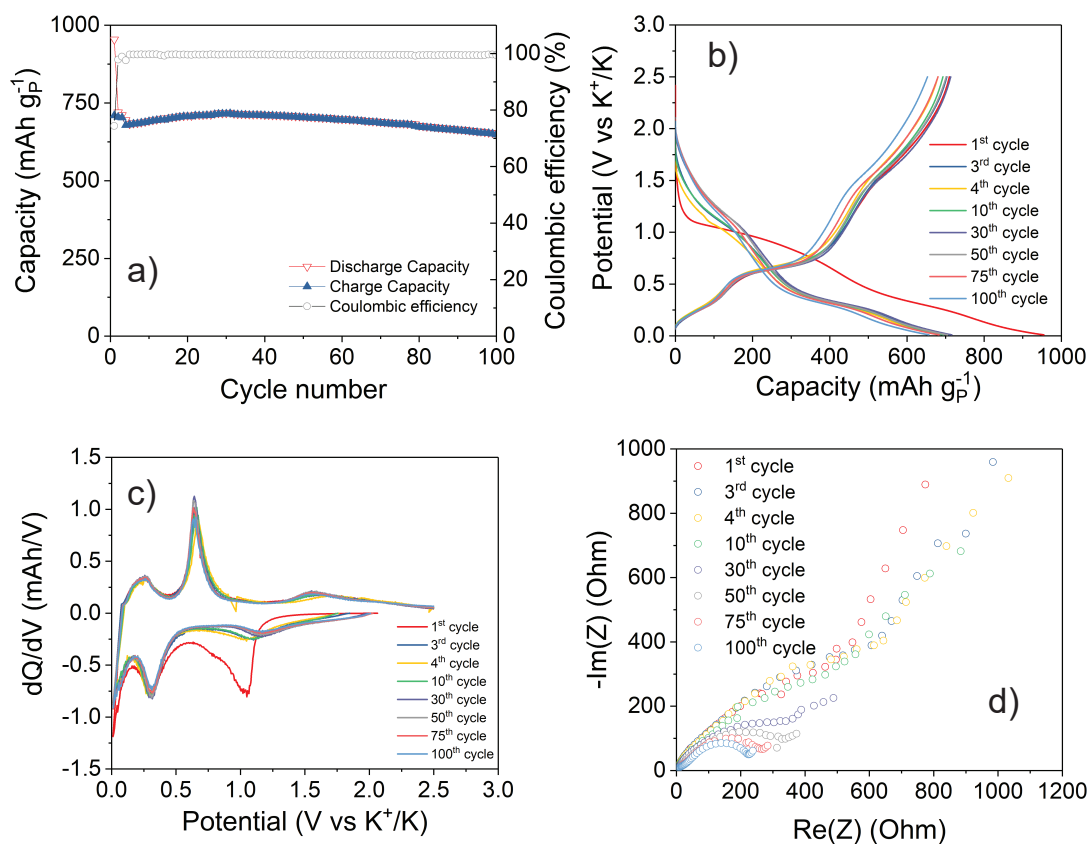


Figure S1. a) Cycle life test of the RP-graphite composite. The first three cycles are a C/20 and the remaining ones at C/10. b) Galvanostatic profiles of the material at different cycles, and (c) differential plot of those cycles. d) Impedance profiles taken after 1 h rest from the end of the cycles.

2 Cross-section EDX

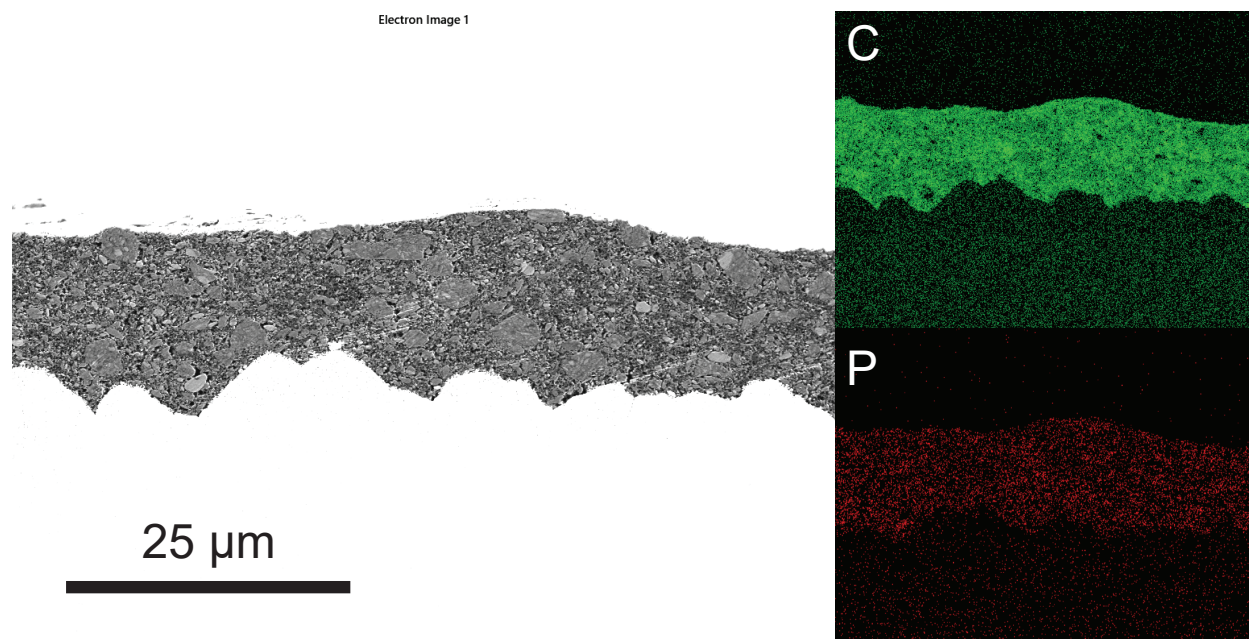


Figure S2. EDX on RP-graphite electrode with signal map for C and P.

3 Operando Raman

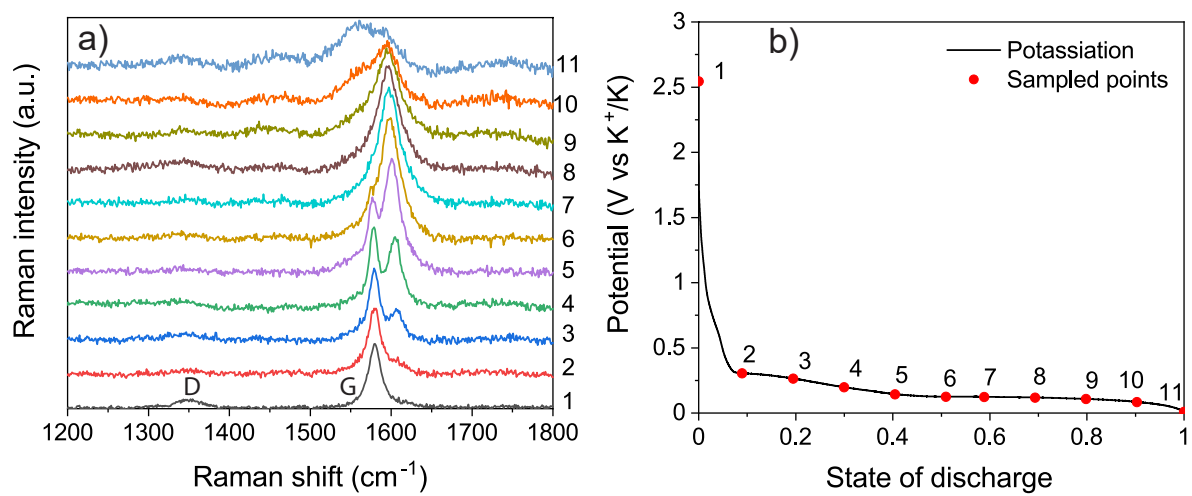


Figure S3. a) Raman operando made on a graphite electrode. b) Points in the galvanostatic profile where the Raman spectrum was taken.

4 Comparison

Material	Electrode composition	Loading $\text{mg}_{\text{electrode}}\text{cm}^{-2}$	Electrolyte	Ref.
RP/C composite	RP(56%) graphite (24%) SuperP (10%) Polyacrylic acid (10%)	1.78	KFSI 1M in EC:DEC (1:1 v/v)	This work
BP-C composite	BP (40%) graphite (40%) SuperP (10%) carboxymethylcellulose (10%)	1.38-1.88	KPF ₆ 0.75M in EC:DEC (1:1 v/v)	[15]
P/C composite	RP (14%) graphite (56%) carbon black (20%) sodium carboxymethylcellulose (10%)	not specified	KPF ₆ 0.8M in EC:DEC (1:1 v/v)	[16]
RP/C composite	RP (64%) Ketjen black (8%) multi-wall carbon nanotubes (8%) sodium carboxymethylcellulose (20%)	1.17-1.72	KTFSI 1M in EC:DEC (1:1 v/v)	[19]
Graphite	graphite (90%) sodium polyacrylate (10%)	1.33	KFSI 7m in 1,2-dimethoxyethane (DME)	[30]
Hard carbon	Hard carbon (85%) acetylene black (10%) sodium polyacrylate (5%)	1.31	KFSI 1M in EC:DEC (1:1 v/v)	[31]
Sn ₄ P ₃ /C composite	Sn ₄ P ₃ /C (%) SuperP (%) carboxymethylcellulose (%)	1.11	KPF ₆ 0.8M in EC:DEC (1:1 v/v)	[32]

Table S1. List of the electrode materials shown in Figure 5. The reference numbers are related to the References list in the main document.