



Building resilient battery supply chains

V0904



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EV demand is growing

BUT BATTERY MATERIAL SUPPLY CHAINS
ARE FALLING BEHIND



Geopolitical dependency

95%

**OF BATTERY GRADE GRAPHITE
IS COMING FROM CHINA**



Localized supply chains

Feedstock technology in carbon black reactors

CARBONX[®] **PATENTED FEEDSTOCK EMULSION** **TECHNOLOGY**

DROP-IN ALTERNATIVE FOR GRAPHITE
BATTERY READY AT PRODUCTION



CARBONX 

Commercially scaled

20

**GW / 40,000 TON PER ANNUM
ACCESSIBLE PRODUCTION CAPACITY
IN EU AND US**

**SECURITY-OF-SUPPLY
PRICE COMPETITIVE
5X LOWER CARBON FOOTPRINT**



1st

**WORLD-WIDE PRODUCING
GRAPHITE DROP-IN
AT 100 TON PER DAY**

**SUPPLIED 1,000 TON
FROM 3 DIFFERENT SITES
GLOBALLY**



CARBON X

Cost effective production

Low energy

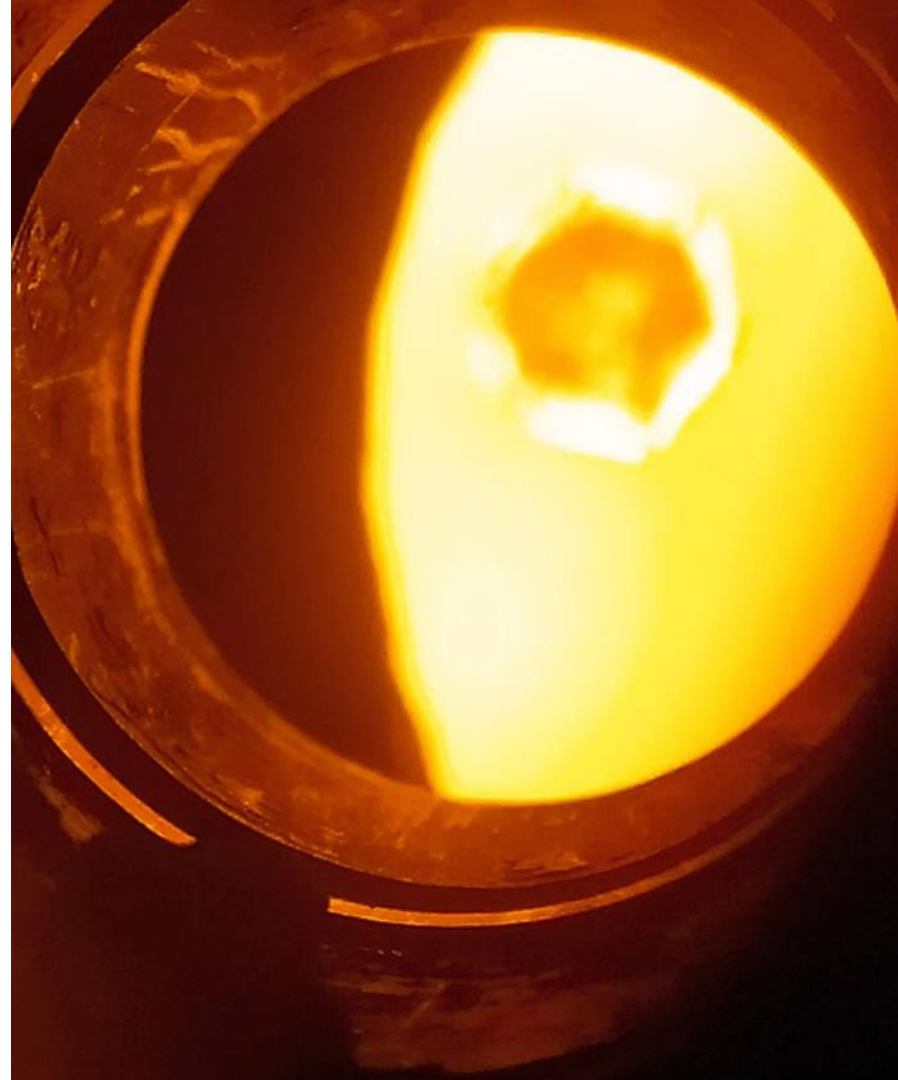
Reactor temperature 2x lower
than synthetic graphite process

High volume

Each line produces ~100 tonnes per day
1 GWh of active material in 10 days

Low cost

Cheaper than synthetic graphite
On-par with natural coated spherical graphite



Lower Carbon Footprint

Low reactor temperatures / short reaction time

CarbonX[®]

2.5 ton CO₂ per ton carbon

1900 °C continuous process

Synthetic graphite

12 ton CO₂ per ton carbon

>3000 °C batch process

Natural graphite

6 ton CO₂ per ton carbon

Mining

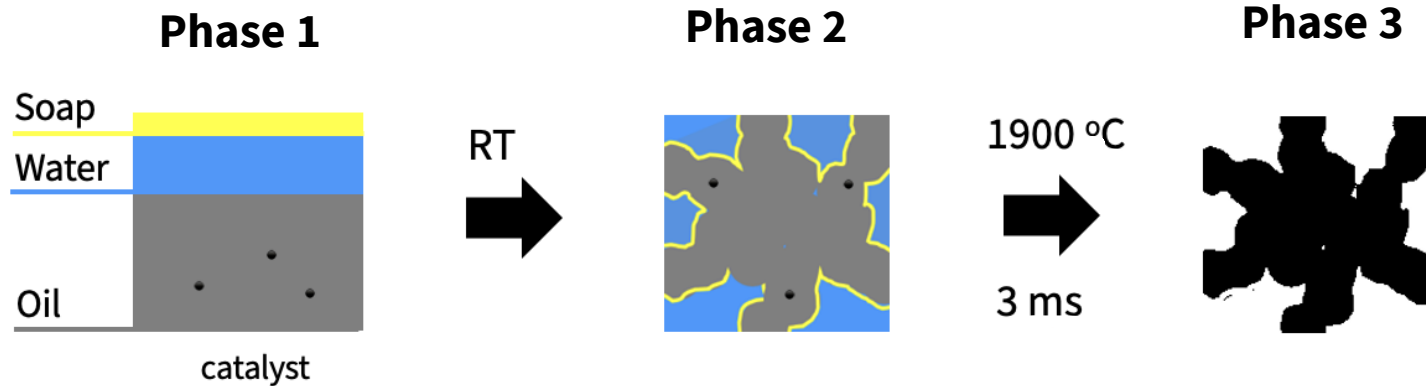
5x
less CO₂

2.5x
less CO₂

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How does it work?

Feedstock emulsion technology as template



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Unique 3D network structure

To overcome graphite's 2D limitations

Improved electron transfer

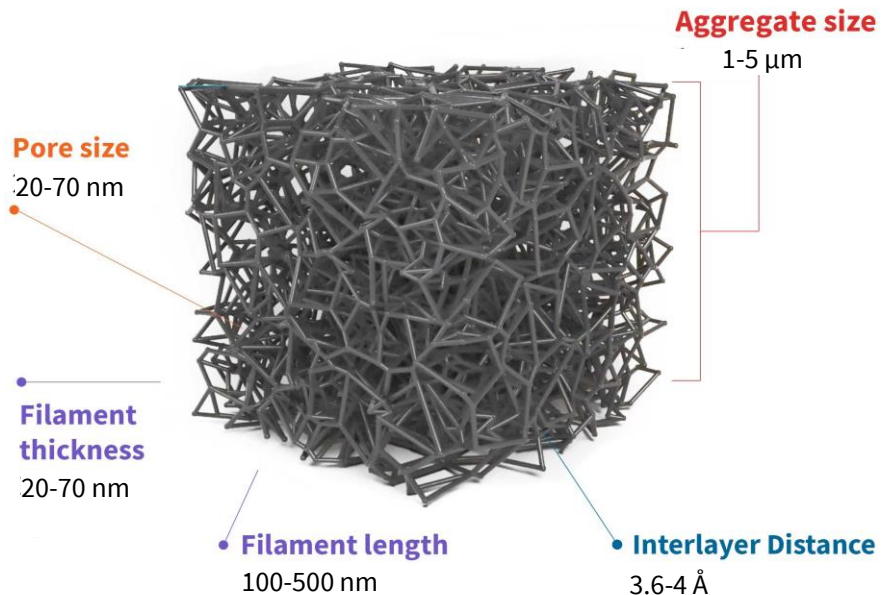
Filaments provide effective conductive pathway
3D network creates shorter diffusion path

Improved Li⁺ transfer

Easier access by larger d-spacing and micropores
3D network is flexible towards large volume changes

High compressibility

3D network structure withstands high compressive loads, keeping the filaments and micropores intact



Technology roadmap

Next-generation batteries by CarbonX®



Fast charge

CarbonX® X7/20C

10C: 50% CarbonX® (**now**)
20C: 100% CarbonX® (**2035**)



Energy density

CarbonX® X7/Si10

750 Wh/L - 10% Si/CarbonX® (**2025**)
1,500 Wh/L - 30% Si/ CarbonX® (**2035**)



Sustainability

CircularX® X7

5 x lower carbon footprint (**now**)
100% circular: pyrolysis oil (**2027**)

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CarbonX[®] X7/SG-50

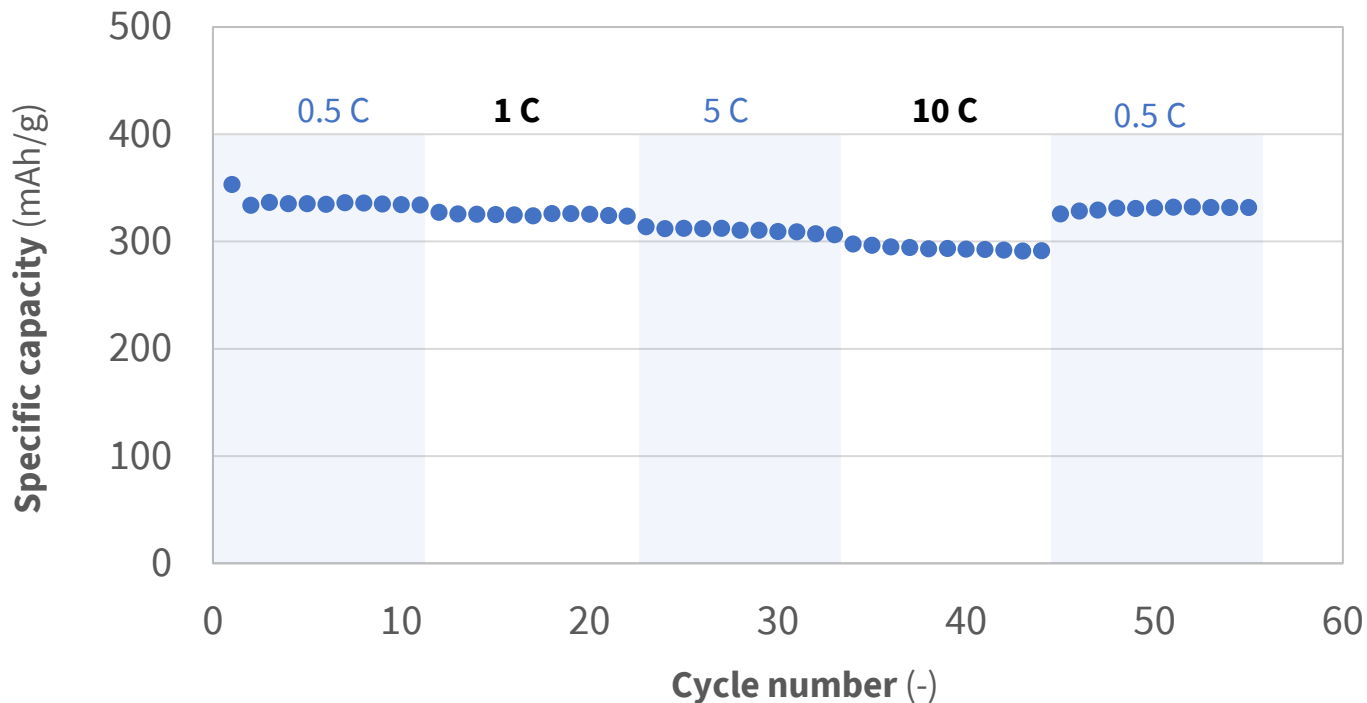
Coin cell performance, water/CMC/SBR

Grade	CarbonX [®] X7/SG-50		
Type	Locally sourced, graphite replacement		
Blend	CarbonX [®] X7: 50%wt, Synthetic graphite: 50%wt		
Property	Unit	Typical Value	Method
Pressed density	g/cc	1.5 ± 0.1	After calendering
Specific capacity	mAh/g	>355	0.2C in half cell, 25 °C, CCCV 0.01V – 2V
FCE	%	89%	0.2C in half cell, 25 °C, CCCV 0.01V – 2V
Charge	C	10	0.5C, 1C, 5C, 10C, 0.5C, half cell, 25 °C, CCCV 0.01V – 2V
Cycle	No.	>1500	100% X7, 1C, half cell, 25 °C, CCCV 0.01V – 2V

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Rate capability test

Stable specific capacity at increasing charge rate



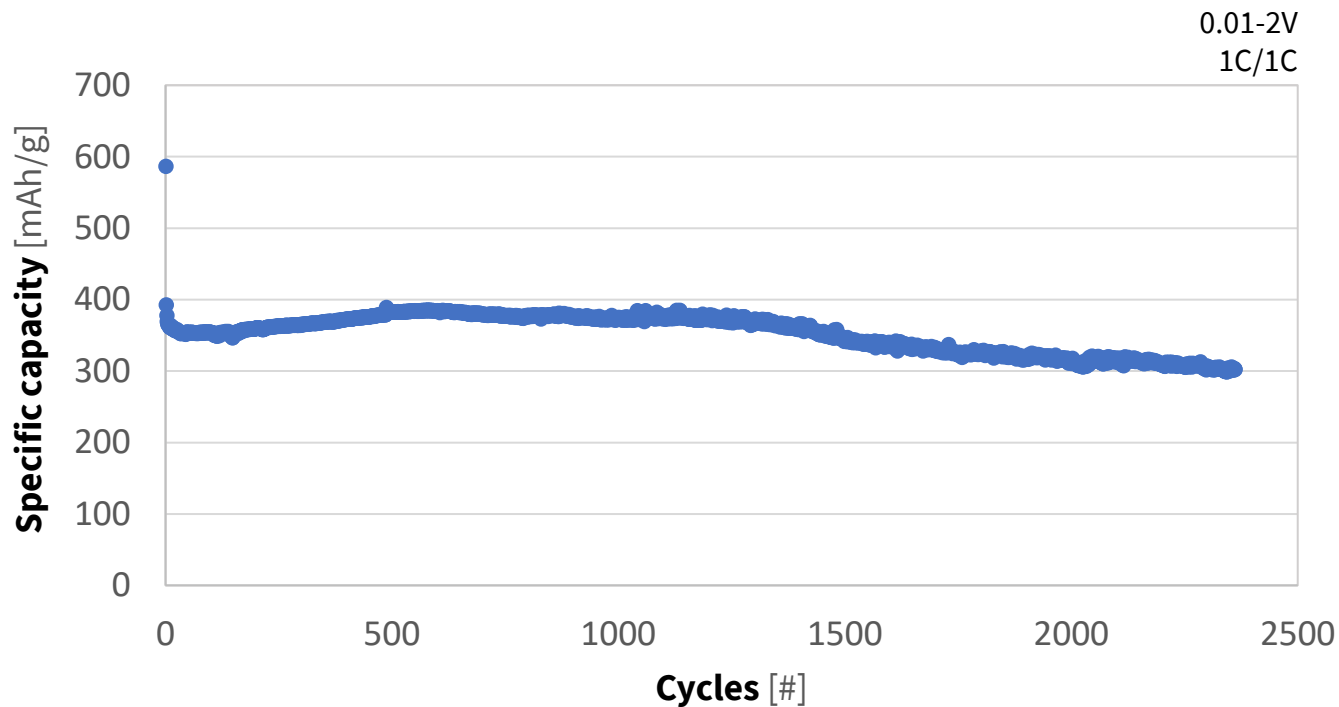
CarbonX® X7/SG-50
Half coin cell
T = 25 °C
CCCV 0.01V - 2V

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Superior cell stability

100% X7



• CarbonX® X7

Half coin cell
SoC 0% - 100%
NMP/PVDF

Capacity retention:
83% @ 2362 cycles

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Work with us!
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