UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 8-K

CURRENT REPORT
Pursuant to Section 13 or 15(d)
of the Securities Exchange Act of 1934

Date of report (Date of earliest event reported): December 8, 2020

QuantumScape Corporation
(Exact Name of Registrant as Specified in Charter)

Delaware	**001-39345**	**85-0796578**
(State or other jurisdiction of incorporation)	**(Commission File Number)**	**(I.R.S. Employer Identification Number)**

1730 Technology Drive **San Jose, California** **(Address of principal executive offices)**	**95110** **(Zip code)**

(408) 452-2000
(Registrant's telephone number, including area code)

Not Applicable
(Former name or former address, if changed since last report)

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the Registrant under any of the following provisions:

☐ Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)

☐ Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)

☐ Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))

☐ Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Class A common stock, par value $0.0001 per share	**QS**	**The New York Stock Exchange**
Redeemable warrants, each whole warrant exercisable for one share of Class A common stock at an exercise price of $11.50	**QS.W**	**The New York Stock Exchange**

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 (§ 230.405) or Rule 12b-2 of the Securities Exchange Act of 1934 (§ 240.12b-2).

Emerging growth company ☒

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Item 7.01 Regulation FD Disclosure

On December 8, 2020, QuantumScape Corporation (the "Company") issued a press release announcing new performance data demonstrating that its technology addresses issues holding back widespread adoption of high-energy density solid-state batteries, including charge time (current density), cycle life, safety, and operating temperature.

The Company's solid-state battery is being designed to enable up to 80% longer range compared to today's lithium-ion batteries. Data as of December 8, 2020 is as follows:

- The Company's newly-released results, based on testing of single layer battery cells, show its solid-state separators are capable of working at very high rates of power, enabling a 15-minute charge to 80% capacity, faster than either conventional battery or alternative solid-state approaches are capable of delivering.
- The tested cells were large-area single-layer pouch cells in the target commercial form factor with zero excess lithium on the anode and thick cathodes (>3mAh/cm2), running at rates of one-hour charge and discharge (1C charge and 1C discharge) at 30 degrees Celsius. These tests demonstrated robust performance of these single layer pouch cells even at these high rates, resulting in retained capacity of greater than 80% after 800 cycles (demonstrating high columbic efficiency of greater than 99.97%).

A copy of the press release is attached as Exhibit 99.1 to this Current Report on Form 8-K. The presentation used to present the data is attached as Exhibit 99.2 to this Current Report on Form 8-K..

The information furnished in this Item 7.01, including Exhibits 99.1 and 99.2, shall not be deemed "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), or otherwise subject to the liabilities of that section, nor shall it be deemed incorporated by reference into any other filing under the Exchange Act or the Securities Act of 1933, as amended, except as expressly set forth by specific reference in such a filing.

This current report contains forward-looking statements within the meaning of the federal securities laws and information based on management's current expectations as of the date of this current report. All statements other than statements of historical fact contained in this current report, including statements regarding the Company's future operating results, financial position, business strategy, addressable market, anticipated benefits of its technologies, projected factory economics, pro forma information, and plans and objectives for future operations and products are forward-looking statements. When used in this current report, the words "may," "will," "estimate," "pro forma," "expect," "plan," "believe," "potential," "predict," "target," "should," "would," "could," "continue," "believe," "project," "intend," "anticipates" the negative of such terms and other similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain such identifying words. These forward-looking statements are based on management's current expectations, assumptions, hopes, beliefs, intentions and strategies regarding future events and are based on currently available information as to the outcome and timing of future events.

These forward-looking statements involve significant risks and uncertainties that could cause the actual results to differ materially from the expected results. Many of these factors are outside the Company's control and are difficult to predict. Factors that may cause such differences include, but are not limited to: (i) the Company faces significant barriers in its attempts to produce a solid-state battery cell and may not be able to successfully develop its solid-state battery cell, which will negatively impact the business; (ii) if the Company's batteries fail to perform as expected, the Company's ability to develop, market and sell its batteries could be harmed; (iii) the Company may encounter substantial delays in the design, manufacture, regulatory approval, and launch of the Company's solid-state battery cells, which could prevent the Company from commercializing any products it determines to develop on a timely basis, if at all; (iv) the Company has a relatively short operating history and operates in a rapidly evolving industry, which makes it difficult to evaluate future prospects and may increase the risk that it will not continue to be successful; (v) the Company may be unable to adequately control the costs associated with its operations and the components necessary to build its solid-state battery cells; (vi) the Company may not be successful in competing in the battery market industry or establishing and maintaining confidence in its long-term business prospectus among current and future partners and customers and (vii) the duration and impact of the COVID-19 pandemic on the Company's business. The Company cautions that the foregoing list of factors is not exclusive. The Company cautions readers not to place undue reliance upon any forward-looking statements, which speak only as of the date made.

Except as otherwise required by applicable law, the Company disclaims any duty to update any forward-looking statements. Should underlying assumptions prove incorrect, actual results and projections could differ materially from those expressed in any forward-looking statements. Additional information concerning these and other factors that could materially affect the Company's actual results can be found in the Company's periodic filings with the SEC. The Company's SEC filings are available publicly on the SEC's website at www.sec.gov.

Item 9.01 Financial Statements and Exhibits.

(d) Exhibits.

Exhibit No.	Description
99.1	Press release by QuantumScape Corporation
99.2	Presentation by QuantumScape Corporation

SIGNATURE

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, hereunto duly authorized.

Dated: December 8, 2020

QUANTUMSCAPE CORPORATION

By: /s/ Michael McCarthy
Name: Michael McCarthy
Title: Chief Legal Officer and Head of Corporate Development

Exhibit 99.1

QuantumScape Releases Performance Data for its Solid-State Battery Technology

Data demonstrates high energy density solid-state lithium-metal battery technology that improves life, charging time, and safety

SAN JOSE, Calif. – DECEMBER 8, 2020 – QuantumScape Corporation (NYSE: QS, or "QuantumScape"), a leader in the development of next generation solid-state lithium-metal batteries for use in electric vehicles (EVs), has released performance data demonstrating that its technology addresses fundamental issues holding back widespread adoption of high-energy density solid-state batteries, including charge time (current density), cycle life, safety, and operating temperature.

A commercially-viable solid-state lithium-metal battery is an advancement that the battery industry has pursued for decades, as it holds the promise of a step function increase in energy density over conventional lithium-ion batteries, enabling electric vehicles with a driving range comparable to combustion engine based vehicles. QuantumScape's solid-state battery is designed to enable up to 80% longer range compared to today's lithium-ion batteries. Previous attempts to create a solid-state separator capable of working with lithium metal at high rates of power generally required compromising other aspects of the cell (cycle life, operating temperature, safety, cathode loading, or excess lithium in the anode).

QuantumScape's newly-released results, based on testing of single layer battery cells, show its solid-state separators are capable of working at very high rates of power, enabling a 15-minute charge to 80% capacity, faster than either conventional battery or alternative solid-state approaches are capable of delivering. In addition, the data shows QuantumScape battery technology is capable of lasting hundreds of thousands of miles and is designed to operate at a wide range of temperatures, including results that show operation at -30 degrees Celsius.

The tested cells were large-area single-layer pouch cells in the target commercial form factor with zero excess lithium on the anode and thick cathodes ($>3 mAh/cm^2$), running at rates of one-hour charge and discharge (1C charge and 1C discharge) at 30 degrees Celsius. These tests demonstrated robust performance of these single layer pouch cells even at these high rates, resulting in retained capacity of greater than 80% after 800 cycles (demonstrating high columbic efficiency of greater than 99.97%).

"The hardest part about making a working solid-state battery is the need to simultaneously meet the requirements of high energy density (1,000 Wh/L), fast charge (i.e., high current density), long cycle life (greater than 800 cycles), and wide temperature-range operation. This data shows QuantumScape's cells meet all of these requirements, something that has never before been reported. If QuantumScape can get this technology into mass production, it holds the potential to transform the industry," said Dr. Stan Whittingham, co-inventor of the lithium-ion battery and winner of the 2019 Nobel prize in chemistry.

“These results blow away what was previously thought to be possible in a solid-state battery,” said Venkat Viswanathan, battery expert and professor of materials science at Carnegie-Mellon University. “Supporting high enough current density to enable fast charge without forming dendrites has long been a holy grail of the industry. This data shows the capability to charge to 80% capacity in 15 minutes, corresponding to an astonishingly high rate of lithium deposition of up to a micron per minute.”

“We believe that the performance data we’ve unveiled today shows that solid-state batteries have the potential to narrow the gap between electric vehicles and internal combustion vehicles and help enable EVs to become the world’s dominant form of transportation,” said Jagdeep Singh, founder & CEO of QuantumScape. “Lithium-ion provided an important stepping stone to power the first generation of EVs. We believe QuantumScape’s lithium-metal solid-state battery technology opens the automotive industry up to the next generation battery and creates a foundation for the transition to a more fully electrified automotive fleet.”

QuantumScape’s team of scientists have worked over the past decade to create the next generation of battery technology: solid-state batteries with lithium-metal anodes. With processes and materials protected by over 200 patents and applications, QuantumScape’s proprietary solid-state separator replaces the organic separator used in conventional cells, enabling the elimination of the carbon or carbon/silicon anode and the realization of an “anode-less” architecture, with zero excess lithium. In such an architecture, an anode of pure metallic lithium is formed in situ when the finished cell is charged, rather than when the cell is produced. Unlike conventional lithium-ion batteries or some other solid-state designs, this architecture delivers high energy density while enabling lower material costs and simplified manufacturing.

Beyond its ability to function at high rates of power while delivering high energy density, other key characteristics of QuantumScape’s solid-state lithium-metal battery technology include:

- **Zero excess lithium:** In addition to eliminating the carbon or carbon/silicon anode, QuantumScape’s solid-state design further increases energy density because it uses no excess lithium on the anode. Some previous attempts at solid-state batteries used a lithium foil or other deposited-lithium anode, which reduces energy density.
- **Long life:** Because it eliminates the side reaction between the liquid electrolyte and the carbon in the anode of conventional lithium-ion cells, QuantumScape’s battery technology is designed to last hundreds of thousands of miles of driving. Alternative solid-state approaches with a lithium metal anode typically have not demonstrated the ability to work reliably at close to room temperatures (30 degrees Celsius) with zero excess lithium at high current densities (>3mAh/cm^2) for more than a few hundred cycles, and result in a short-circuit or capacity loss before the life target is met. By contrast, today’s test results show that QuantumScape’s battery technology is capable of running for over 800 cycles with greater than 80% capacity retention.

- **Low-temperature operation:** QuantumScape's solid-state separator is designed to operate at a wide range of temperatures, and it has been tested to -30 degrees Celsius, temperatures that render some other solid-state designs inoperable.
- **Safety:** QuantumScape's solid-state separator is noncombustible and isolates the anode from the cathode even at very high temperatures — much higher than conventional organic separators used in lithium-ion batteries.

About QuantumScape Corporation

QuantumScape is a leader in the development of next generation solid-state lithium-metal batteries for use in electric vehicles. The company's mission is to revolutionize energy storage to enable a sustainable future.

For additional information, please visit www.quantumscape.com.

Forward Looking Statements

The information in this press release includes "forward-looking statements" within the meaning of Section 27A of the Securities Act and Section 21E of the Securities Exchange Act of 1934, as amended. All statements, other than statements of present or historical fact included in this press release, including, without limitation, regarding the development, timeline and performance of QuantumScape's products and technology are forward-looking statements. When used in this press release, the words "is designed to," "could," "should," "enables," "will," "may," "believe," "anticipate," "intend," "estimate," "expect," "project," the negative of such terms and other similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain such identifying words. These forward-looking statements, including statements about other solid-state battery systems and their limitations, and our belief that our battery solution opens the industry up to the next generation of EVs, are based on management's current expectations and assumptions about future events and are based on currently available information as to the outcome and timing of future events.

These forward-looking statements involve significant risks and uncertainties that could cause the actual results to differ materially from the expected results. Most of these factors are outside QS's control and are difficult to predict. Factors that may cause such differences include, but are not limited to: (i) QS faces significant barriers in its attempts to scale from a single layer pouch cell and complete development of its solid-state battery cell and related manufacturing processes, and development may not be successful, (ii) QS may encounter substantial delays in the development, manufacture, regulatory approval, and launch of QS solid-state battery cells, which could prevent QS from commercializing products on a timely basis, if at all, (iii) QS may be unable to adequately control the costs of manufacturing its solid-state separator and battery cells, and (iv) QS may not be successful in competing in the battery market. QS cautions that the foregoing list of factors is not exclusive. Additional information about factors that could materially affect QS is set forth under the "Risk Factors" section in the proxy statement/prospectus/information statement filed by Kensington Capital Acquisition Corp. with the SEC on November 12, 2020 and available on the SEC's website at www.sec.gov.

Except as otherwise required by applicable law, QuantumScape disclaims any duty to update any forward-looking statements, all of which are expressly qualified by the statements in this section, to reflect events or circumstances after the date of this press release. Should underlying assumptions prove incorrect, actual results and projections could different materially from those expressed in any forward-looking statements.

For Media

media@quantumscape.com

Exhibit 99.2

NEXT-GENERATION SOLID-STATE BATTERIES

December, 2020

Forward Looking Statements

This presentation contains forward-looking statements within the meaning of the federal securities laws and information based on management's current expectations as of the date of this presentation. All statements other than statements of historical fact contained in this presentation, including statements regarding QuantumScape's future operating results, financial position, business strategy, addressable market, anticipated benefits of its technologies, projected factory economics, pro forma information, and plans and objectives for future operations and products are forward-looking statements. When used in this presentation, the words "may," "will," "estimate," "pro forma," "expect," "plan," "believe," "potential," "predict," "target," "should," "would," "could," "continue," "believe," "project," "intend," "anticipates" the negative of such terms and other similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain such identifying words. These forward-looking statements are based on management's current expectations, assumptions, hopes, beliefs, intentions and strategies regarding future events and are based on currently available information as to the outcome and timing of future events. QuantumScape cautions you that these forward-looking statements are subject to all of the risks and uncertainties, most of which are difficult to predict and many of which are beyond the control of QuantumScape, incident to its business.

These forward-looking statements involve significant risks and uncertainties that could cause the actual results to differ materially from the expected results. Many of these factors are outside QuantumScape's control and are difficult to predict. Factors that may cause such differences include, but are not limited to: (i) QuantumScape faces significant barriers in its attempts to produce a solid-state battery cell and may not be able to successfully develop its solid-state battery cell, which will negatively impact the business; (ii) if QuantumScape's batteries fail to perform as expected, QuantumScape's ability to develop, market and sell its batteries could be harmed; (iii) QuantumScape may encounter substantial delays in the design, manufacture, regulatory approval, and launch of QuantumScape's solid-state battery cells, which could prevent QuantumScape from commercializing any products it determines to develop on a timely basis, if at all; (iv) QuantumScape has a relatively short operating history and operates in a rapidly evolving industry, which makes it difficult to evaluate future prospects and may increase the risk that it will not continue to be successful; (v) QuantumScape may be unable to adequately control the costs associated with its operations and the components necessary to build its solid-state battery cells; (vi) QuantumScape may not be successful in competing in the battery market industry or establishing and maintaining confidence in its long-term business prospectus among current and future partners and customers and (vii) the duration and impact of the COVID-19 pandemic on QuantumScape's business. QuantumScape cautions that the foregoing list of factors is not exclusive. QuantumScape cautions readers not to place undue reliance upon any forward-looking statements, which speak only as of the date made. Further information about factors that could materially affect QuantumScape, including its results of operations and financial condition, is set forth under the "Risk Factors" section in the Form 8-K filed by QuantumScape with the SEC on December 2, 2020.

Except as otherwise required by applicable law, QuantumScape disclaims any duty to update any forward-looking statements, all of which are expressly qualified by the statements in this section, to reflect events or circumstances after the date of this presentation. QuantumScape cautions you that these forward-looking statements are subject to numerous risks and uncertainties, most of which are difficult to predict and many of which are beyond the control of QuantumScape. Should underlying assumptions prove incorrect, actual results and projections could different materially from those expressed in any forward-looking statements. Additional information concerning these and other factors that may impact the operations and projections discussed herein can be found in QuantumScape's periodic filings with the SEC. QuantumScape's SEC filings are available publicly on the SEC's website at www.sec.gov.


Agenda
QuantumScape Overview and Results
Jagdeep Singh, CEO
Battery Science Panel
Dr. David Danielson (Moderator)
Dr. Stanley Whittingham
Dr. Paul Albertus
Dr. Venkat Viswanathan
Dr. Tim Holme
Commercial Impact on EVs Panel
Dr. David Danielson (Moderator)
Dr. Jurgen Leohold
JB Straubel
Questions & Answers
Jagdeep Singh, CEO
QuantumScape

Management Team

Select Management Team Members

JAGDEEP SINGH
Founder / CEO
(Chairman)

- Founder / CEO Infinera (NASDAQ: INFN); Lightera, now Ciena (NASDAQ: CIEN); OnFiber, now Qwest; AirSoft
- MS Computer Science, Stanford

Infinera ciena

PROF. FRITZ PRINZ
Founder & Chief Scientific Advisor (Board Member)

- Chair, Mechanical Engineering, Stanford
- Professor, Materials Science, Stanford
- PhD, Physics, University of Vienna

Stanford University · University of Vienna

DR. TIM HOLME
Founder & Chief Technology Officer

- Research Associate, Stanford
- Ph.D. & MS Mechanical Engineering, Stanford
- BS Physics, Stanford

Stanford University

DR. MOHIT SINGH
Chief Development Officer

- CTO and co-founder, SEEO
- Solid-state energy storage world expert
- Ph.D. Chem & Biomol Eng, Tulane
- Postdoc, Polymers, Berkeley

Berkeley · SEEO

KEVIN HETTRICH
Chief Financial Officer

- Bain Capital
- McKinsey & Company
- US Department of Energy
- MBA & MS, Stanford

BainCapital · McKinsey & Company

HOWARD LUKENS
Chief Sales Officer

- VP WW Sales, Infinera (NASDAQ: INFN)
- VP Strategic Sales, Ciena, (NASDAQ: CIEN)
- VP WW Sales, Lightera

Infinera ciena

JAY UNDERWOOD
Vice President, Sales

- Sales Director, Northern Europe, Infinera
- Product Planning, Infinera
- MS Technology

Infinera

MIKE MCCARTHY
Chief Legal Officer & Head of Corp. Dev.

- CLO & CAO, Infinera (NASDAQ: INFN)
- SVP & General Counsel, Ciena (NASDAQ: CIEN)
- J.D. Vanderbilt

Infinera ciena

QuantumScape

QuantumScape

Backed by Leading Investors

SELECT BOARD MEMBERS AND INVESTORS

JOHN DOERR

KPCB | KLEINER PERKINS CAUFIELD BYERS

JB STRAUBEL

TESLA

JUSTIN MIRRO

KENSINGTON

DIPENDER SALUJA

C>PRICORN

cadence

JÜRGEN LEOHOLD

VOLKSWAGEN

BRAD BUSS

TESLA | CYPRESS | MARVELL | Advanced Micro Devices

FRANK BLOME

VOLKSWAGEN

KENSINGTON CAPITAL ACQUISITION CORP

KENSINGTON

- Management and board with extensive public company experience and operating capabilities in the automotive and automotive-related sector
- Relevant automotive experience to optimize program launches and capital deployment while facilitating commercial relationships
- Track record of creating significant shareholder value in automotive businesses

EXISTING INVESTORS

VOLKSWAGEN

Continental

Breakthrough Energy VENTURES

SAIC MOTOR

Lightspeed

Bill Gates

khosla ventures

KPCB | KLEINER PERKINS CAUFIELD BYERS

C>PRICORN

QuantumScape

By the Numbers

>$1.5B of Committed Capital[1]

Over $300M spent on development to date

10 Years of R&D Investment

Founded in 2010

250+ Employees

World Class Next-gen Battery Development Team

200+ Patents[2]

Materials, Use and Process

Extensive Trade Secrets

Processes and Intellectual Property

1. Prior to its merger with Kensington, QuantumScape secured over $800 million in committed funds. With the addition of the $700 million from its merger with Kensington and subsequent PIPE financing, QuantumScape will have received more than $1.5 billion in commitments to date
2. Includes patents and patent applications.

Volkswagen Committed to QuantumScape Technology

Volkswagen Group Overview

VOLKSWAGEN

- ~11 million vehicles produced in FY2019
- ~$38 billion investment in electric mobility by 2024
- Plans to launch ~70 electric vehicle models and produce 22 million electric vehicles by 2029

Select Brands

Volkswagen Partners with QuantumScape

1. Corporate funding commitment of $300+ million
2. Strong relationship since 2012, including development collaboration, testing of prototype cells and representation on the QS board of directors
3. Founded a JV to prepare for the mass production of solid-state batteries for Volkswagen

"Volkswagen has become the largest shareholder of QuantumScape. Our US$100 million investment is a key building block in the Group's battery strategy. One of the long-term targets is to establish a production line for solid-state batteries by 2025."

- Herbert Diess, Volkswagen AG CEO

"The Volkswagen Group has established a joint venture with QuantumScape, a manufacturer of solid-state batteries. The shared goal of the companies is large-scale production..."

- Oliver Blume, Porsche CEO

"In June 2020, the Volkswagen Group also announced plans to increase its shareholding in the US battery specialist QuantumScape. The objective is to promote the joint development of solid-state battery technology. In the future, solid-state batteries should result in a significantly increased range and faster charge times. They are regarded as the most promising approach to electric mobility for generations to come. Volkswagen has already been collaborating with QuantumScape since 2012 and is the largest automotive shareholder thus far. Both founded a joint venture in 2018, the aim of which is to prepare the mass production of solid-state batteries for Volkswagen."

- Volkswagen Group Half-Yearly Financial Report, July 2020

Source: Volkswagen AG Half-Yearly Financial Report published July-2020, 2019 Annual Report published Mar-2020, press releases published Mar-2019, Nov-2019 and Jun-2020, Half-year press conference published Aug-2018; Porsche Annual Press Conference published Mar-2019). Page 18 based on Volkswagen AG press release published Sep-2018.

QuantumScape

Need battery breakthrough to enable electrification of remaining 98% of market

2% PHEV + BEV Penetration²

Customer Requirements for Mass Market Adoption

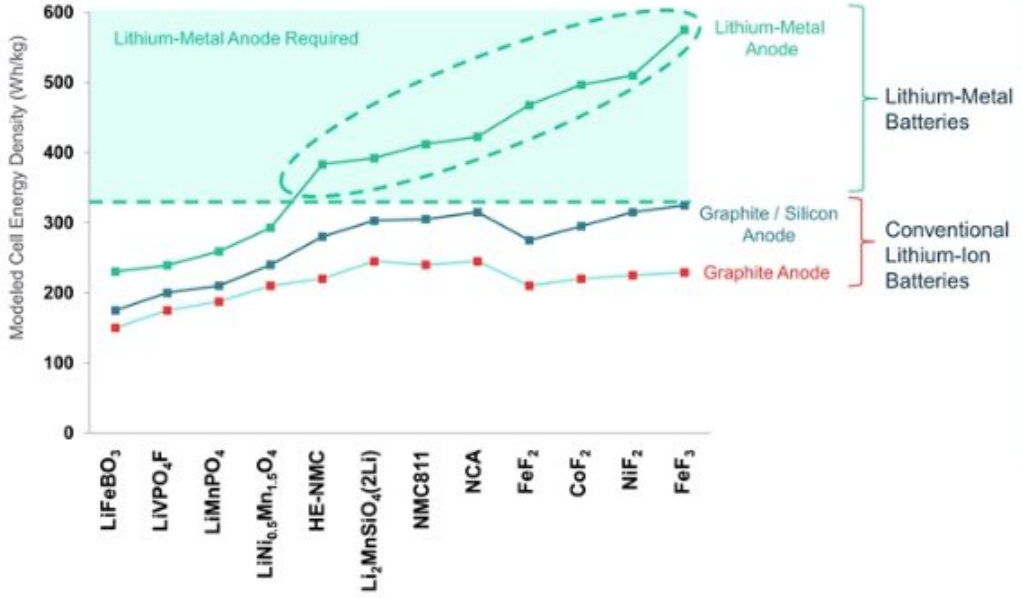
- **Energy / Capacity**
  >300 mile range
- **Fast Charging**
  Charge in <15 min
- **Cost**
  < $30K, 300 mile EVs
- **Battery Lifetime**
  >12 years, >150k miles
- **Safety**
  Solid, non-oxidizable separator

QuantumScape

Source: International Organization of Motor Vehicle Manufacturers (OICA); IEA
(1) Based on 2019 global vehicle production; includes passenger vehicles, heavy trucks, buses and coaches (OICA). Battery opportunity assumes $100 / KWh and 50KWh+ battery pack.
(2) % of Global Car Stock in 2019 (IEA).

Lithium-Metal Anode is Required for High Energy Density

And Lithium metal anode requires a solid-state separator



Key Takeaways

Lithium-metal anode necessary to achieve high energy density

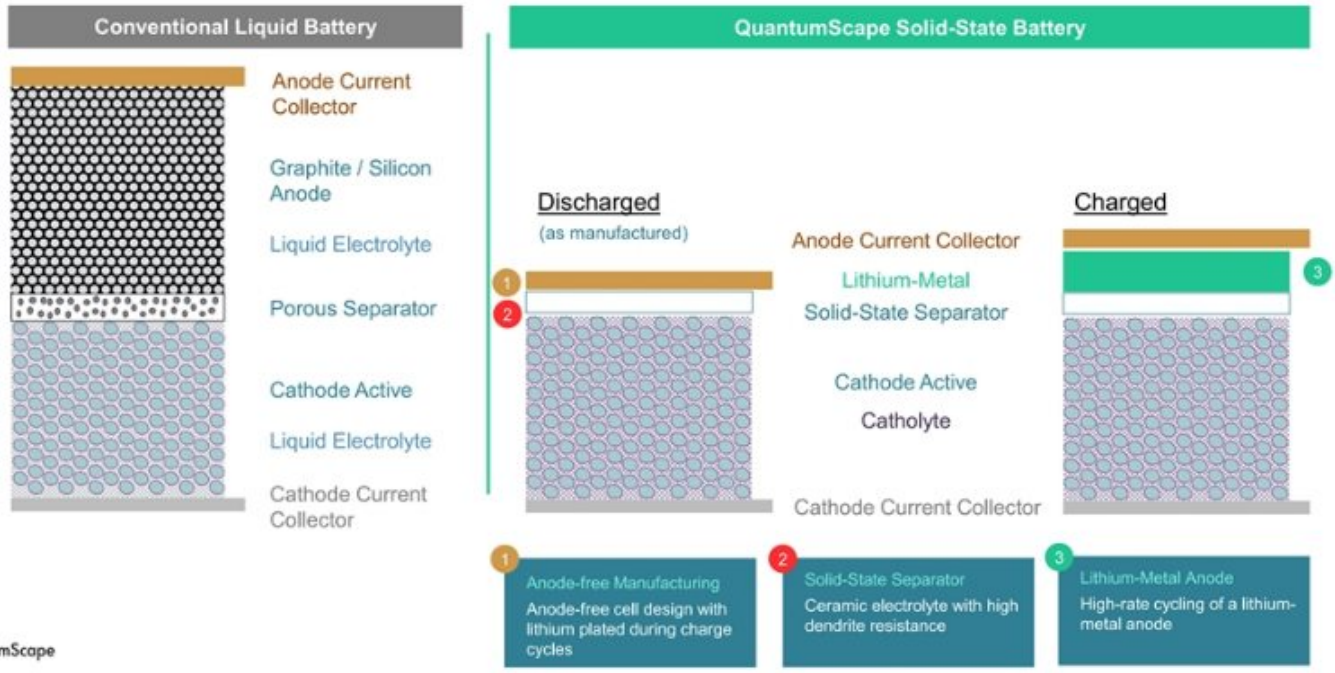
Lithium-metal cannot be used without a solid-state separator

QuantumScape

Source: Andre *et al*, *J Mater Chem A*, (2015) 6709

QuantumScape Zero Li Anode-free Architecture

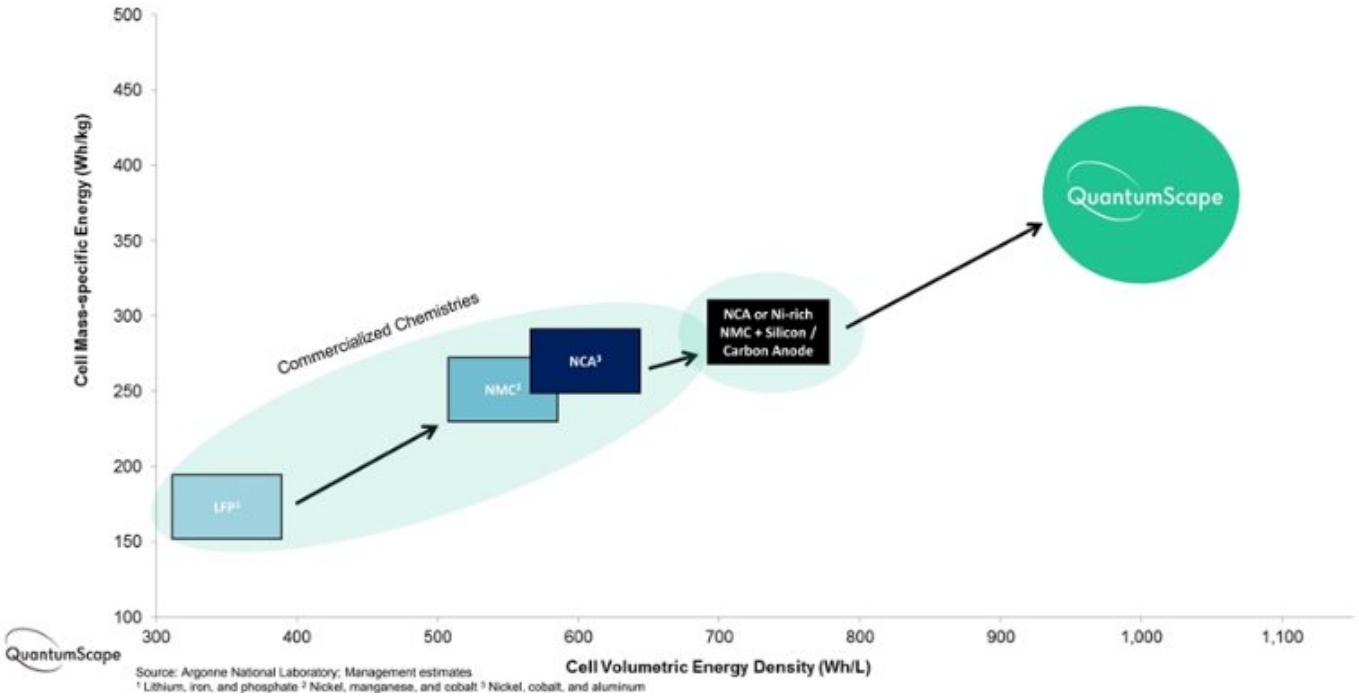
Improved cost, energy density, safety



QuantumScape

QuantumScape Energy Density

Energy-optimized Cell Designs



Source: Argonne National Laboratory; Management estimates

¹ Lithium, iron, and phosphate ² Nickel, manganese, and cobalt ³ Nickel, cobalt, and aluminum

QuantumScape

Lithium metal architecture addresses multiple requirements simultaneously

Energy	Significantly increases volumetric and gravimetric energy density by eliminating graphite/silicon anode host material.
Fast Charge	Enables <15-minute fast charge (0 to 80%) by eliminating lithium diffusion bottleneck in anode host material.
Life	Increased life by eliminating capacity loss at anode interface.
Safety	Eliminates organic separator. Solid-state separator is nonflammable and noncombustible.
Cost	Lower cost by eliminating anode host material and manufacturing costs.

Previous Attempts Have Been Unsuccessful

X = challenge

	Lithium Metal Anode							
	Organics				Inorganics			
Separator Requirements	Ionic liquids	Additives / Protected Layer	Gel	Polymer	Sulfides	Phosphates & Perovskites	Garnets	LiPON, borohydrides
1 Conductivity	X			X				X
2 Separator-Anode ASR		X	X	X		X	X	
3 Lithium metal stability	X		X			X		
4 Dendrite resistance	X	X	X	X	X	X	X	X

Also must be thin and continuously processed at low cost over large area

QuantumScape


Video
Why has it
been so challenging
to develop Solid-State
Batteries
QuantumScape

QuantumScape

Existing separators only work under severely compromised conditions

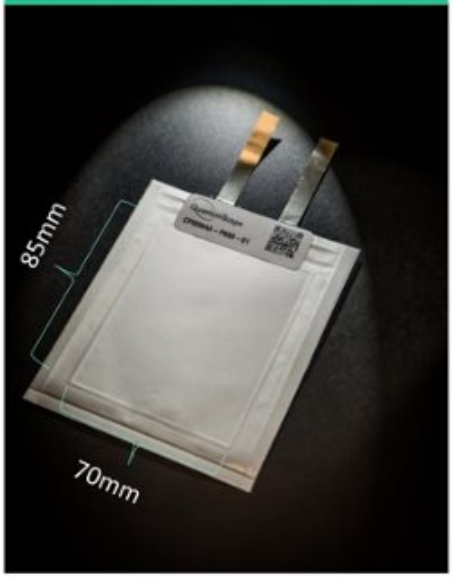
Low Current Density while Charging • Low Cathode Loading or Low C-rate	Slow Charge
Low Cycle Life • < 800 cycles	Life
Limited Temperature Range • Elevated only	Cost Complexity
Requires Excess Lithium	Low Energy

QuantumScape

QuantumScape Material & Cell

CERAMIC SOLID-STATE SEPARATOR

SINGLE LAYER POUCH CELL

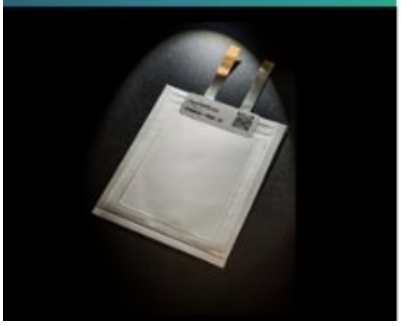


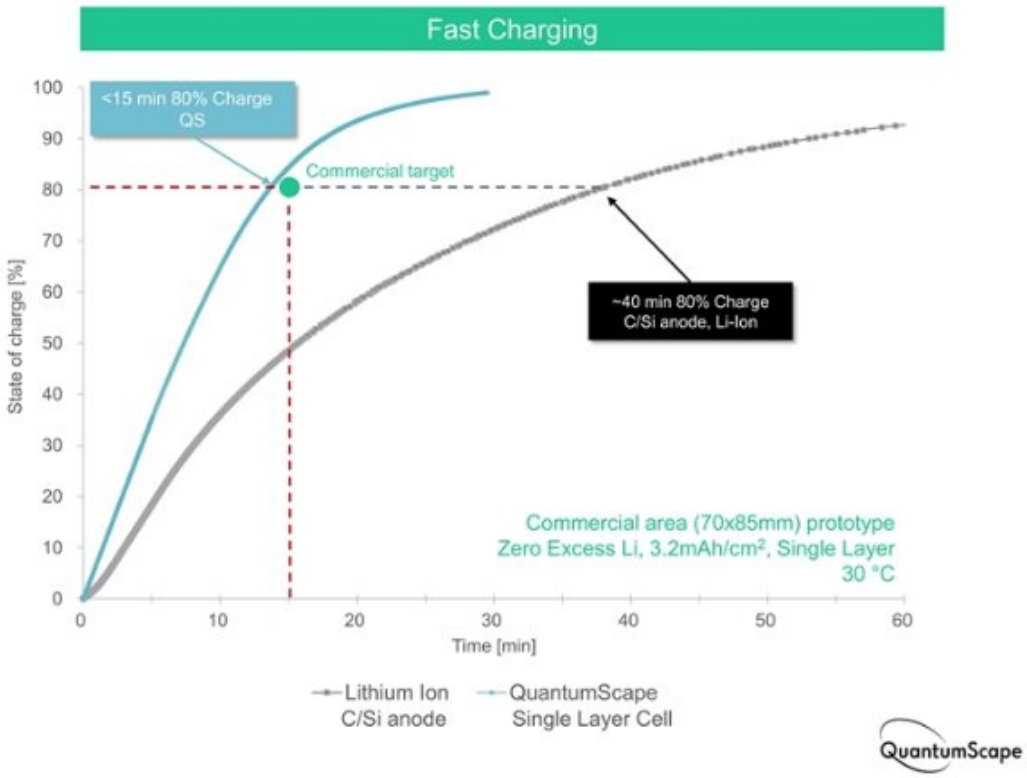
QuantumScape

Fast Charging

Fast charge capability exceeds commercial targets with commercial area single layer prototype

80% Charge in 15 minutes. Lithium Ion batteries currently only get to <50% in 15 minutes



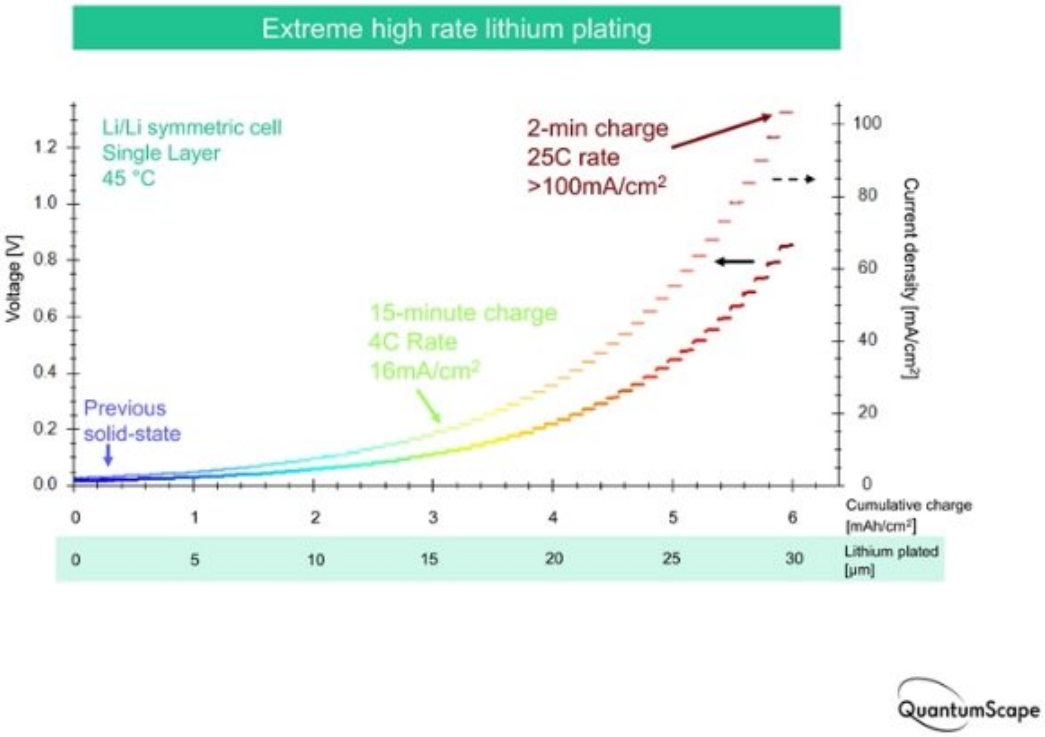


Material Performance: Dendrite Resistance

Material entitlement exists for full charge in <5 min

Solid-state separator resists dendrites even at very high current density

Based on solid-state separator material testing



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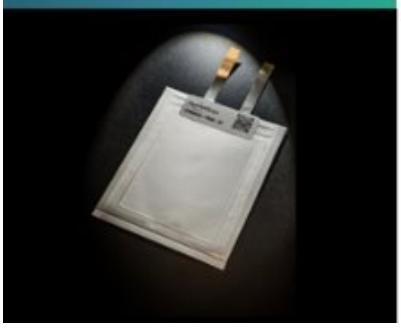
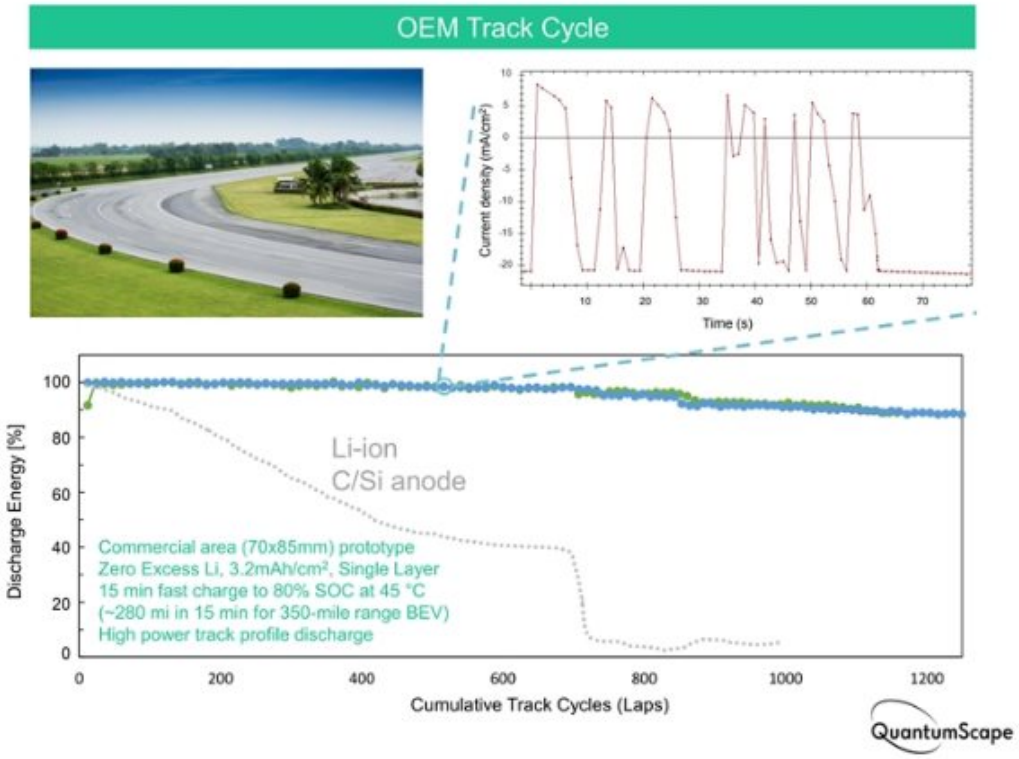
Power

Passed simulated OEM-specified track cycle with commercial area prototype

QS solid state cells can deliver aggressive automotive power profiles



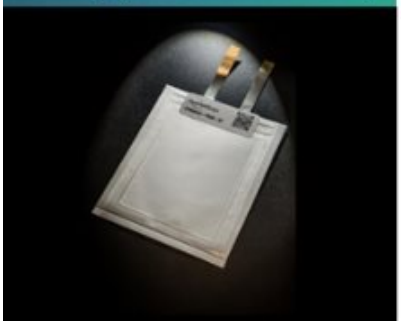


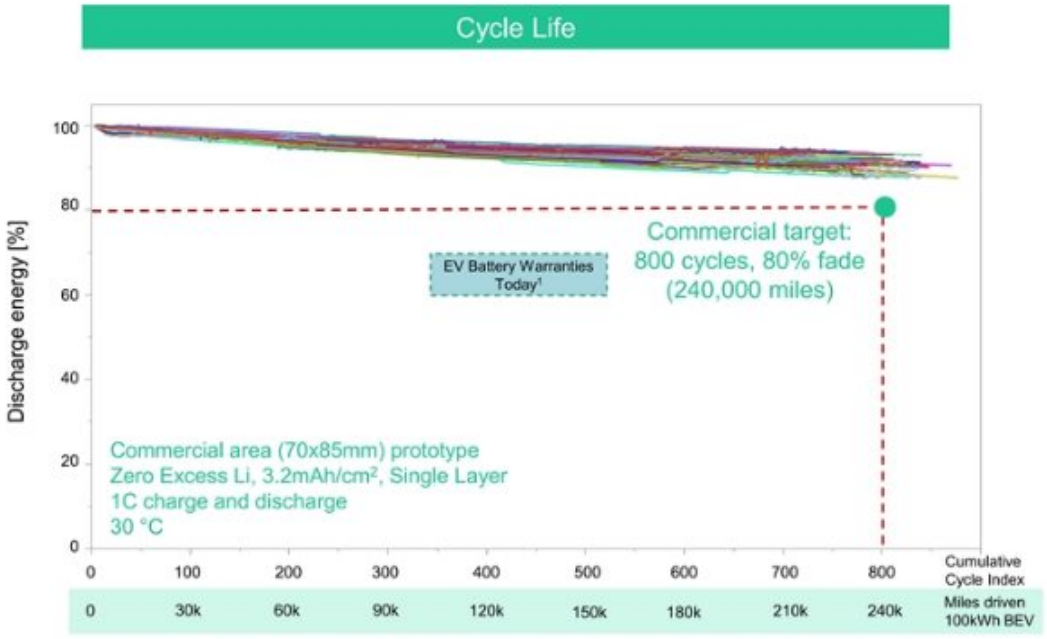
Battery Life

Meets commercial target with commercial area single layer prototype

Cycling with >80% energy retention in 800+ cycles (still on test)

Chart based on accelerated testing (3x automotive rates)





1) Source: MyEV.com and Tesla.com

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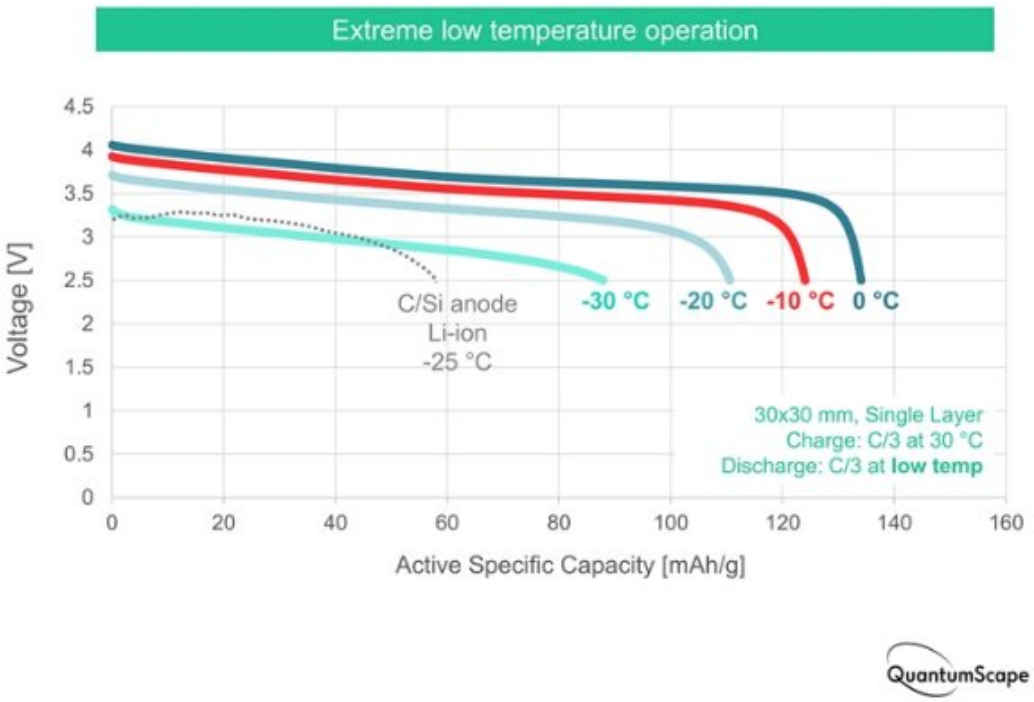
Material Performance: Low Temp

Operability shown at lower end of automotive temperature range with single layer prototype (30 x 30 mm)

Significant capacity is accessible even at -30° Celsius



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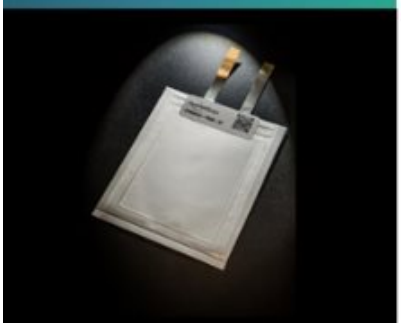
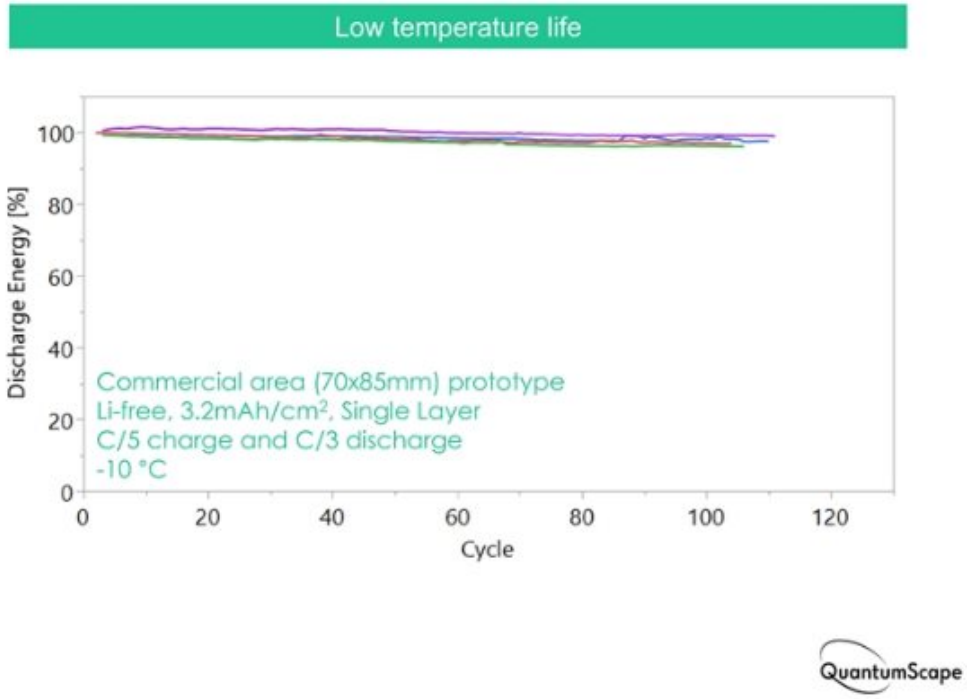
Cell Performance: Low Temp

Cycling with commercial area single layer prototype at low temperature (-10° Celsius)

Note: cells still on test





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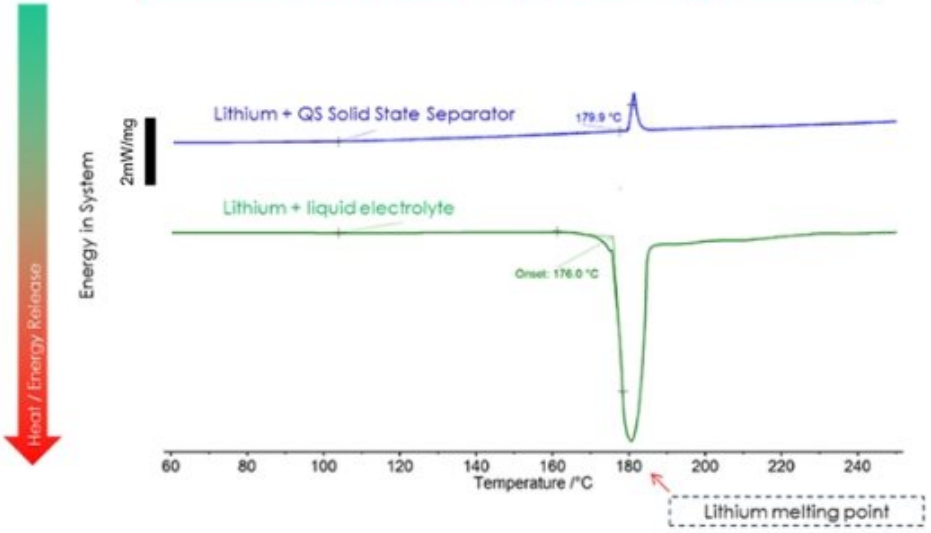
Material Performance: Thermal Stability

Solid state separator is not combustible and has high thermal stability

Lithium anode is chemically stable with separator and foil, even when molten

Based on solid-state separator material testing

Inherent stability with metallic lithium



Unlike a liquid electrolyte, QS solid-state separator has no appreciable reaction with molten lithium metal

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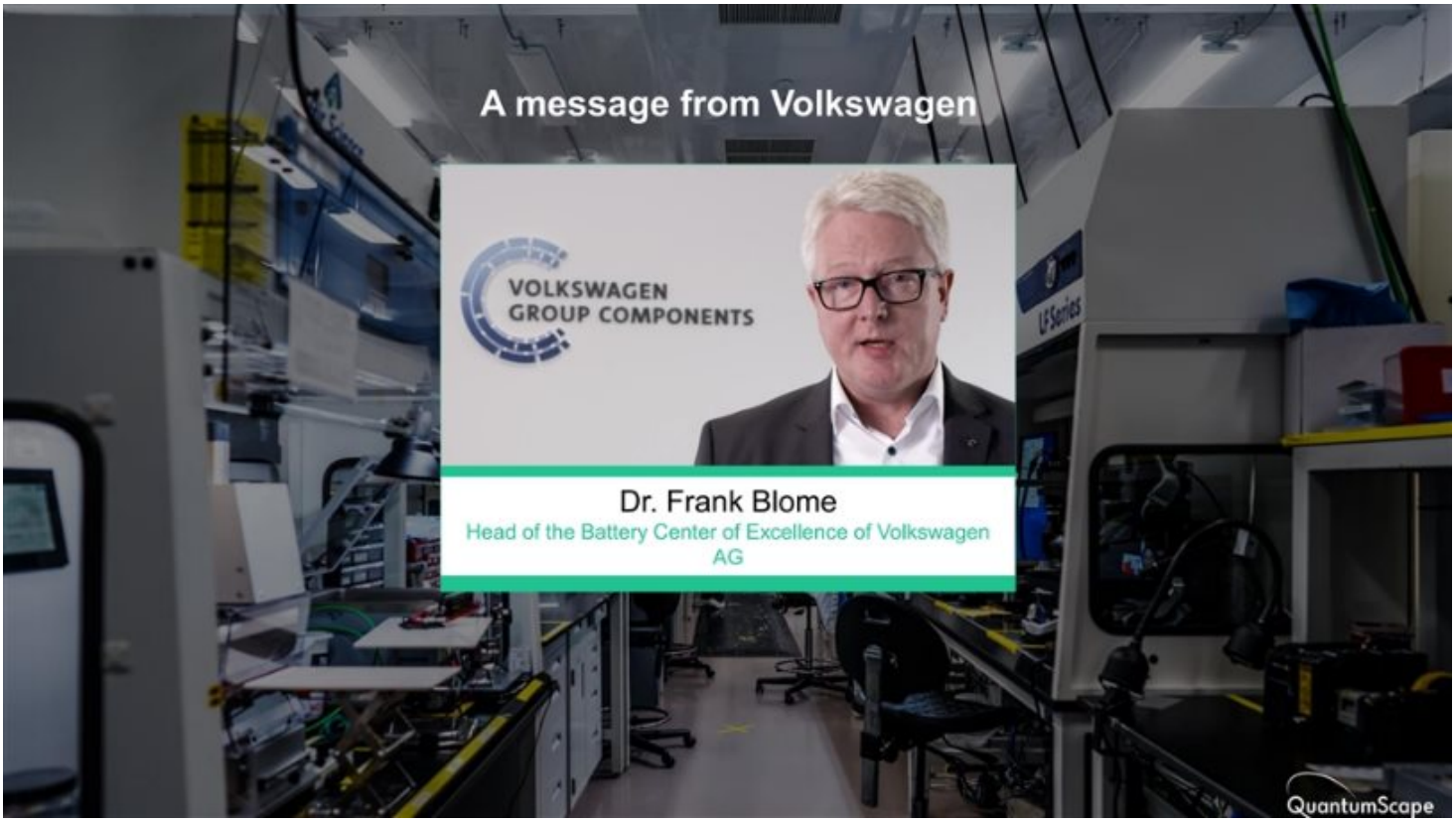
A message from Volkswagen
VOLKSWAGEN
GROUP COMPONENTS
Dr. Frank Blome
Head of the Battery Center of Excellence of Volkswagen AG
QuantumScape

Previous Lithium Metal Cells Have Been Commercially Unsuccessful

		Lithium Metal Anode						
		Organics		Inorganics				
	Performance Requirements	Liquids	Polymers	Sulfides I	Sulfides II	Oxides	QuantumScape	Performance Implication
1	Charge rate	X	X		X	X	✓ 4C fast charge	Fast charge
2	Cycle life	X			X	X	✓ >800 cycles	Vehicle life & cost of ownership
3	30 °C operation		X	X	X		✓ 30 °C cycling	Cold temperature driving
4	Anode-free	X	X	X	X	X	✓ Li-free	Energy density (excess lithium required)

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Today's Panel Discussions

Moderator

Dr. David Danielson
- Managing Director, Breakthrough Energy Ventures
- Precourt Energy Scholar, Stanford
- Former Head of US DOE EERE Program

Battery Science Panel

Dr. Stanley Whittingham
- Co-Inventor of the Lithium-Ion Battery
- 2019 Chemistry Nobel Prize Winner
- Distinguished Professor of Chemistry, Binghamton University (SUNY)
- Member QuantumScape Science Advisory Committee

Dr. Paul Albertus
- Former head, US DOE ARPA-E IONCS Solid-State Battery program
- Assistant Professor of Chemistry, University of Maryland

Dr. Venkat Viswanathan
- Battery expert, former lithium-air researcher
- Assistant Professor of Mechanical Engineering, Carnegie-Mellon University
- Member QuantumScape Science Advisory Committee

Dr. Tim Holme
- Founder and Chief Technology Officer, QuantumScape
- Research Associate, Stanford
- Ph.D. & MS Mechanical Engineering, Stanford

Commercial Impact on the EV Market

JB Straubel
- Co-founder and CEO of Redwood Materials
- Co-founder and Former Chief Technology Officer, Tesla
- Board Member, QuantumScape

Dr. Jürgen Leohold
- Board Member, QuantumScape
- Former Head Group Research, Volkswagen
- Former Professor Vehicle Systems and Electrical Engineering, University of Kassel
- Board Member, QuantumScape

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