NEXCERIS

where energy meets environment

Nexceris Company Overview

May 2021

About Nexceris

Nexceris, LLC

- Founded in 1994, privately held
- Based in Lewis Center, Ohio
- **Products:** Sensors, next generation batteries, and solid oxide fuel cells

LI-ION TAMER®

FCM fuelcellmaterials.com
PERFORMANCE AND QUALITY DELIVERED

ISO 9001 2015 CERTIFIED

Our Vision and Mission

Our Values

People-First Culture

Customers Are Our Focus

Passion Leads to Success

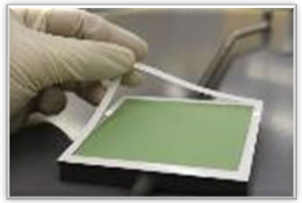
Innovation Provides Value

Integrity is Essential

Nexceris has a long and rich history

1994 — NEXTECH MATERIALS

SOFC Technology R&D Begins



2000 — FCM

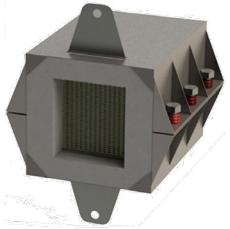
Catalyst R&D Begins

Sensor R&D Begins

2006

NO_x Sensor Development Begins

Fuel Cell Stack R&D Begins



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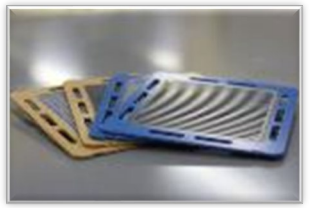
Coatings R&D Begins



2012

H_2 Alarm Box Launched

ISO 9001 Certified

SOFC Corrosion Protection Coating Commercialized

2020

NO_x Sensor Introduced to Customers

Li-ion Tamer Partnership with Honeywell

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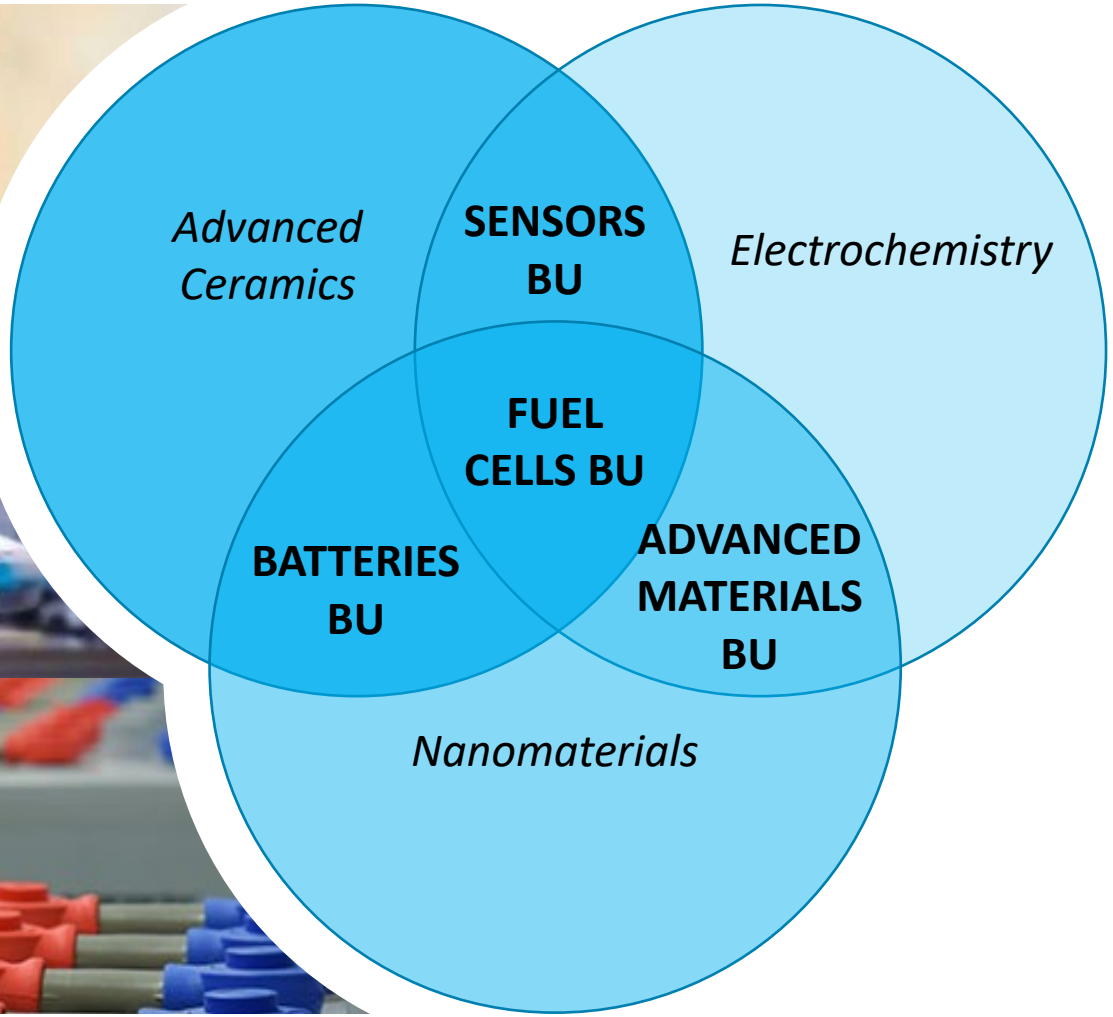
Our four businesses units align with our core technologies



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Product Overview: Li-ion Tamer

Li-Ion Tamer Vision: *To create a new paradigm of lithium-ion battery safety that allows for the secure deployment of energy storage*

- Detects presence of off-gas up to 30 minutes prior to fire or thermal runaway
- Li-ion Tamer can alert the battery system that a fire is imminent, and mitigating action can be taken (*golden time*) → shut off power source
- Only safety solution that can prevent a lithium-ion battery fire
- Partnership/JV established in 2020 with Honeywell
- 150 projects globally representing over 3 GWh

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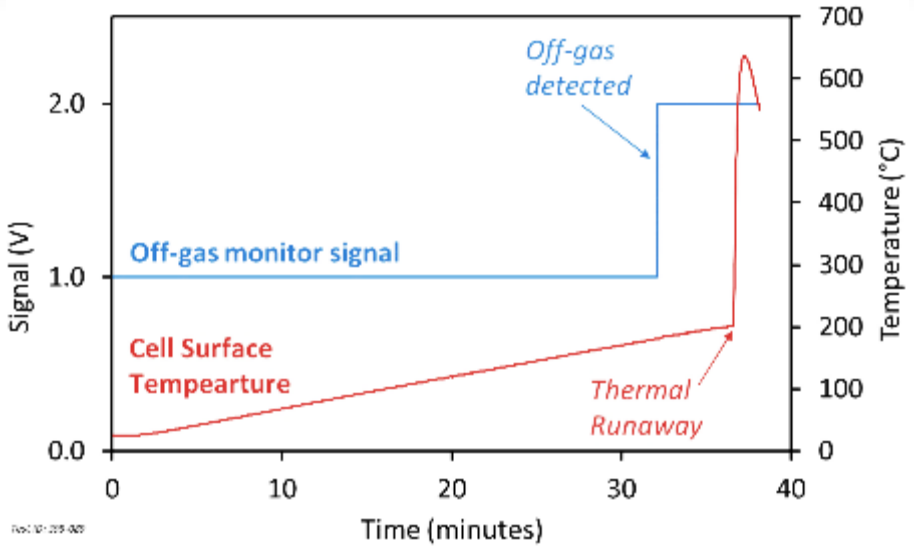
How can off-gas detection provide an additional barrier to thermal runaway?

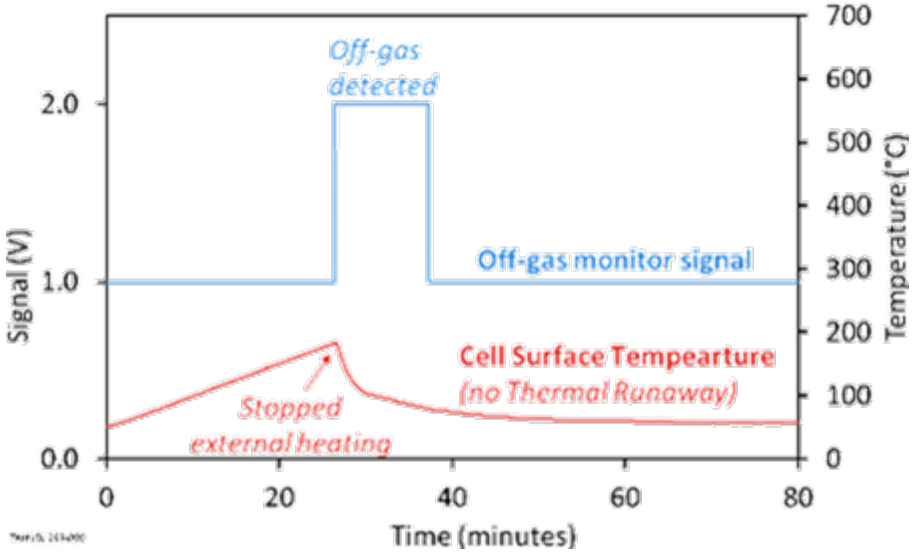
Battery Fault Detection

- Off-gas is precursor to battery failure
- Detection of off-gas can provide early warning
- Incipient fault detection



Battery Failure Mitigation

- Remove abuse from cell
- Additional barrier to thermal runaway
- Improves hazard mitigation analysis for a BESS



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Advanced Materials Group

Nexceris' **Advanced Materials Group** delivers high quality fuel cell and battery materials, coatings, and related materials for R&D and OEM markets.

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Nexceris SOC Development History

Nexceris, LLC

- **1994-1999:** Company founded, initial work on SOFC materials development.
- **2000-2005:** Broad ranging R&D on SOFC materials and fabrication technologies.
- **2005-2006:** Invented high-performance electrolyte-supported planar cell designs.
- **2007-2011:** Initiated SOFC stack development, core stack design technology established.
- **2012-2017:** Military purpose SOFC stack/system design and development.
- **2018-2021:** Focused on increasing technology maturity for military power systems.
- **2018-2021:** ARPA-E project on SOFC stack development and 100+ kW hybrid power systems.
- **2019-2021:** Developed high performance electrodes for high temperature electrolysis.

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Nexceris SOC Facilities

SOC Materials Production

- **Powder Synthesis and Characterization:** Nexceris manufactures electrode materials used in solid oxide cells in volumes of tons per year. We also have complete powder characterization capabilities for these materials.
- **Calcination and Sintering Furnaces:** Nexceris has multiple electronically controlled sintering furnaces used for manufacture of ceramic powders and components. Many of these furnaces are dedicated for specific materials to minimize cross contamination.

Nexceris SOC Facilities

SOC Cell Fabrication

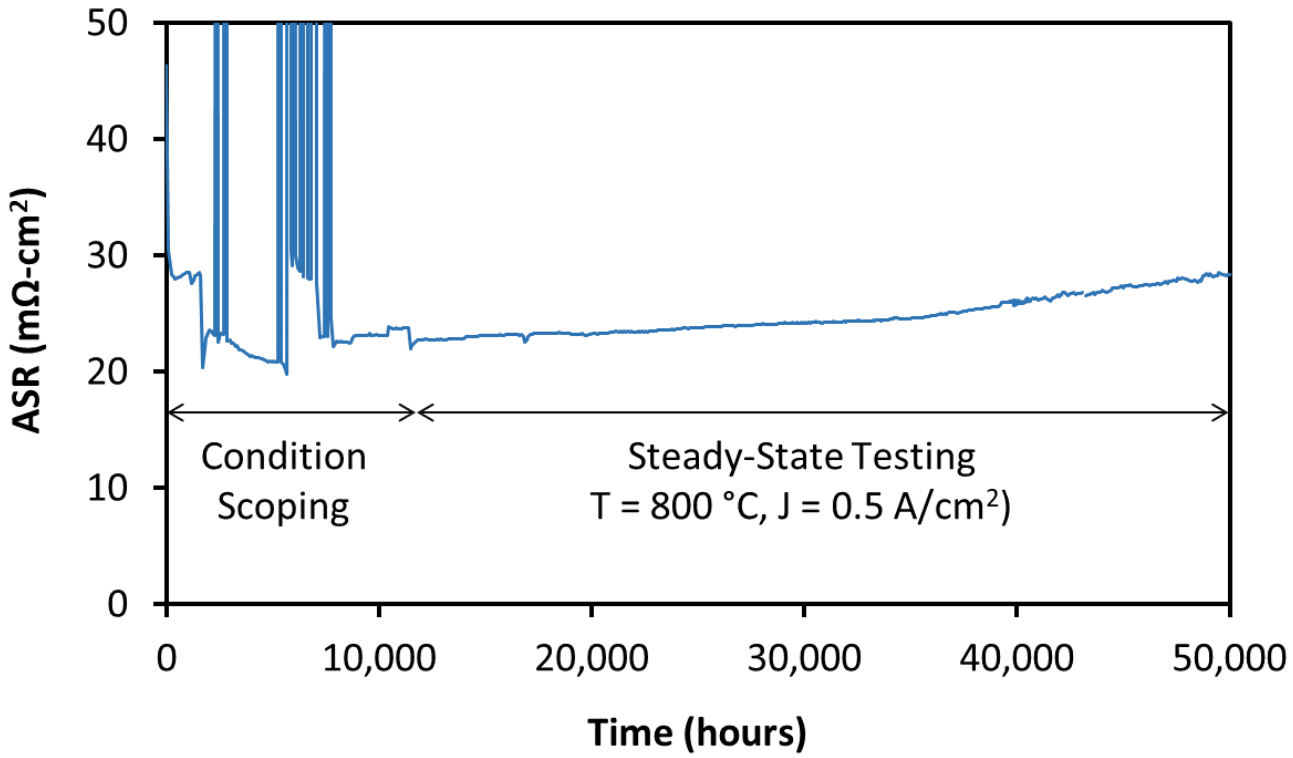
- **Tape Casting:** Nexceris has a Class-10,000 clean room where tape casting and tape handling operations are performed.
- **Cell Fabrication:** Planar ceramic cells are manufactured with unit operations of laser cutting, isostatic lamination, sintering, and ultrasonic spraying for electrode deposition.

Nexceris SOC Facilities

SOC Stack Fabrication and Testing

- **Stack Construction:** Nexceris has a stack fabrication line with robots for controlled seal deposition and appropriate tooling for proper stack alignment during the build process.
- **Stack Testing:** Nexceris has a complete SOFC/SOEC stack testing capability, with automated reactant delivery, furnace controls, and data collection.

Interconnect Coatings (ChromLok™)



Nexceris' commercialized manganese cobalt oxide (MCO) coating technology to protect metallic interconnects from corrosion, which is critical for long stack life in SOFC and HTE applications.

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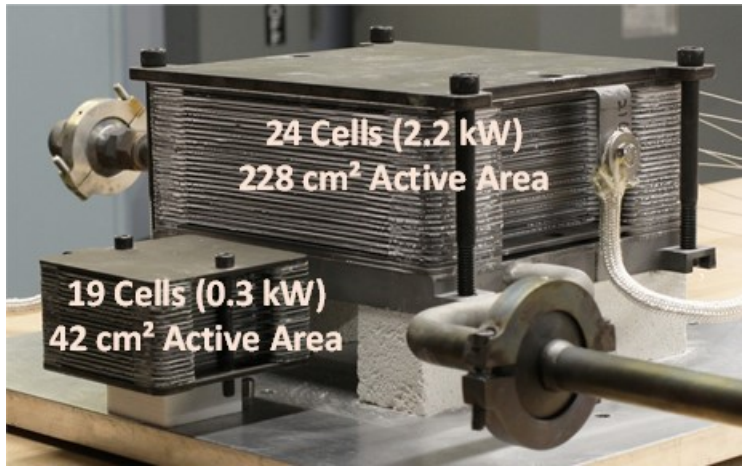
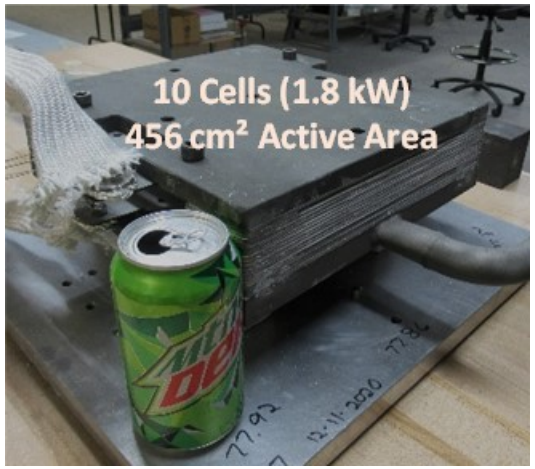
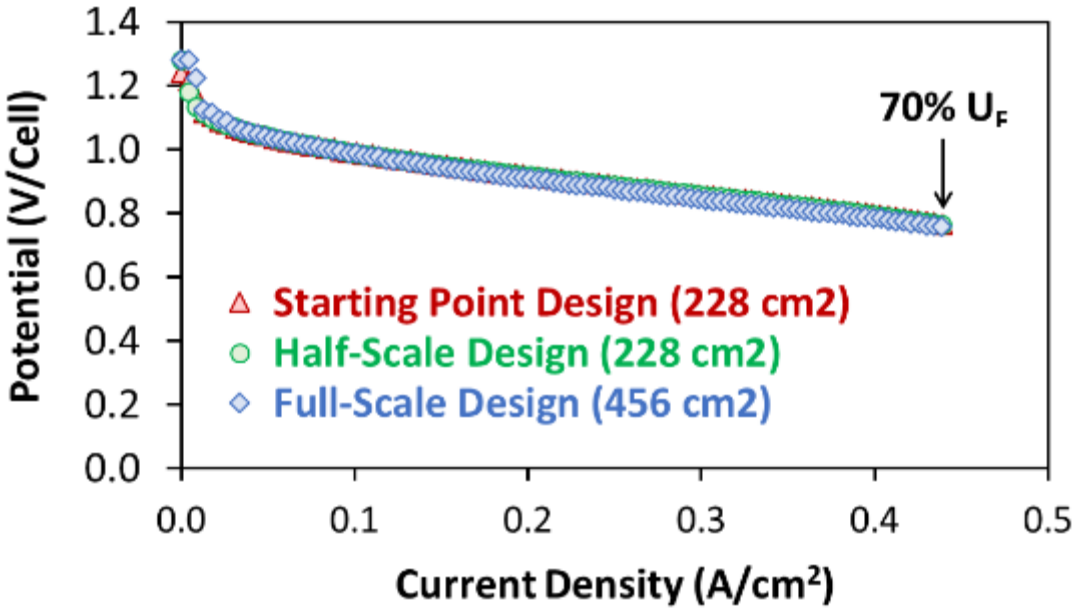
Accomplishments (Phase I)

- Developed and validated model for reducing thermal gradients by spatially controlling the internal reforming reaction.
- Developed and implemented improved sealing materials and approaches to enable pressurized stack operation.
- Established two large-area stack design platforms (half-scale design for validation testing, full-scale design for integration into prototype system).
- Validated stack designs by replicating targeted performance in stacks with 228 and 456 cm^2 active area.







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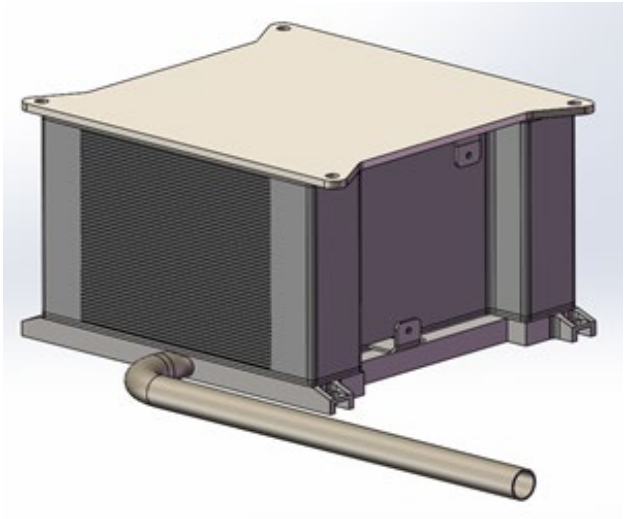
Nexceris ARPA-E Project

Project Vision

Nexceris' team will design, build and demonstrate an ultra-high efficiency power system by hybridizing Nexceris' pressure tolerant and high efficiency fuel cell stack with a gas turbine.



Phase II Project Activities

- ❑ **Nexceris:** SOFC stack production scale-up. Stack supply for system builds.
- ❑ **Nexceris:** Pressurized testing of stacks (in collaboration with NETL).
- ❑ **Czero:** Hybrid system design/modeling and controls development.
- ❑ **Brayton Energy:** Turbine, combustor and heat exchanger technology.
- ❑ **Czero:** BOP procurement and system builds. Hybrid system validation and demonstration testing.

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