

LAMBIENT TECHNOLOGIES CORPORATE OVERVIEW 2024

PRECISION CURE MEASUREMENT SOLUTIONS FOR R&D, QA/QC AND MANUFACTURING

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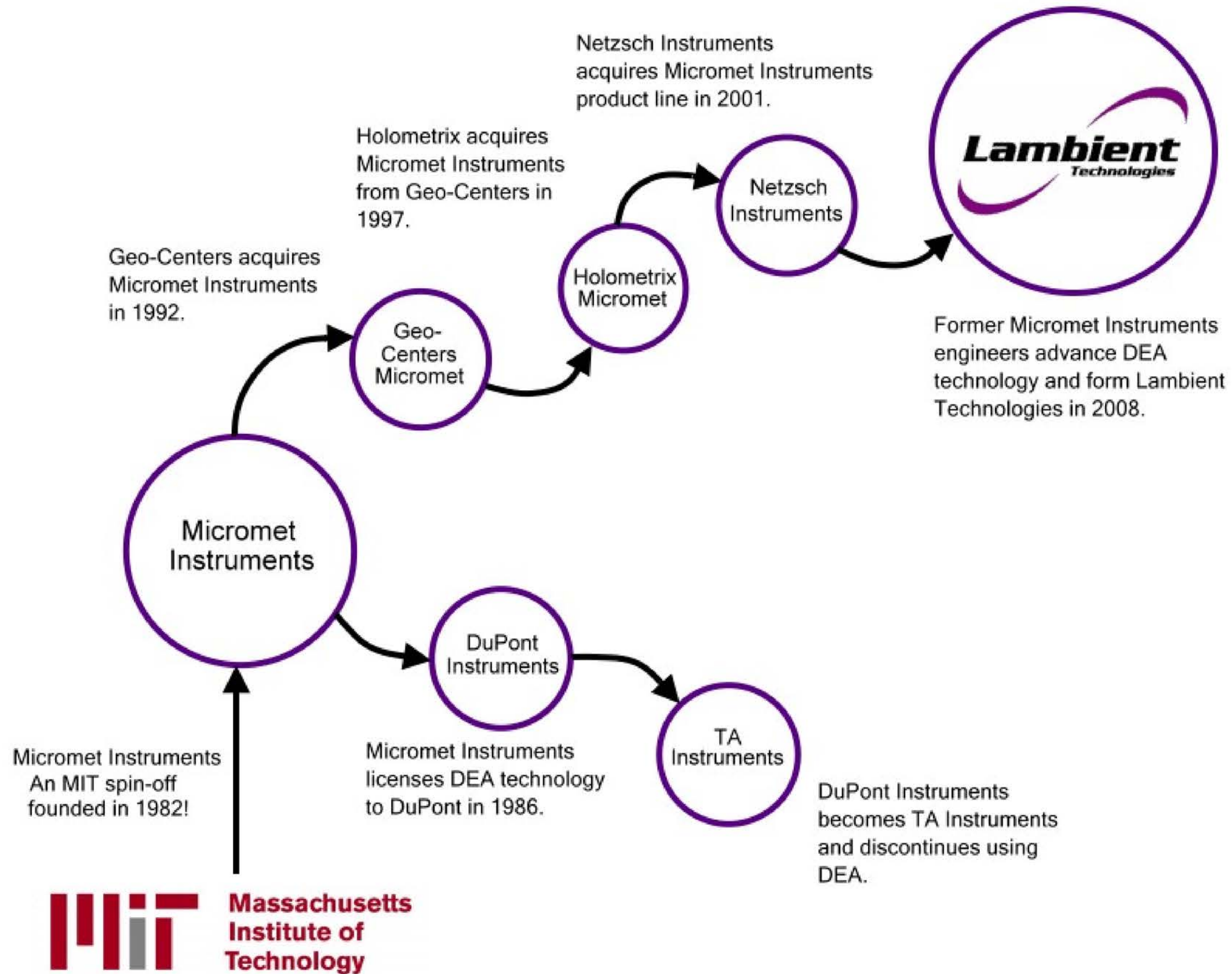
Stop guessing.



OUR BACKGROUND

- Founded in 2008
- Located in Cambridge, Massachusetts, USA
- Commercializes DEA technology developed at the Massachusetts Institute of Technology
- Has worldwide presence with distributors in USA, Europe, Asia, and Australia
- Huan Lee and Stephen Pomeroy, Principals

OUR HISTORY



OUR DISTRIBUTORS



United States



Republic of Korea



United Kingdom



Japan



Taiwan and China



Central Europe



Australia/New Zealand

OUR CUSTOMERS

- Manufacturers of raw resins and materials
- Suppliers of monomers, resins and catalysts
- Suppliers of adhesives, paints and coatings
- Manufacturers of pre-impregnated (pre-preg) composites, Bulk Molding Compound (BMC), Sheet Molding Compound (SMC), Epoxy Molding Compound (EMC), Carbon-fiber/glass-fiber/Kevlar-fiber sheets or laminates
- Manufacturers of composite end products
- Aircraft manufacturers
- Automobile manufacturers
- Electronics manufacturers
- Consumer products
- Government agencies with R&D

OUR PRODUCT CAPABILITIES

The background of the slide features two sleek, futuristic racing cars on a track. The car on the left is bright yellow with black accents, while the car on the right is a vibrant purple. They are positioned on a grey track with yellow double lines, suggesting a high-speed race. The scene is set against a bright, clear sky, creating a sense of motion and advanced technology.

- Rugged, flexible instruments, sensors, and software for monitoring the dielectric properties of curing thermosets and composites
- Insight into chemistry, formulation, reaction rate, viscosity, and cure state of epoxies, polystyrenes, polyurethanes, silicones, SMC, BMC, and other resins and polymers
- An integrated system for studying polymers and optimizing manufacturing processes
 - Material Sampling
 - Research and Development
 - Quality Assurance and Control
 - Production and Manufacturing

OUR ADVANTAGES

- Longest experience with cure monitoring in the industry (40+ years)
- Knowledge based on rigorous physics of curing thermosets
- Extensive library of application notes
- Products developed, designed and tested in-house
- Products manufactured in the United States
- Products sold by experienced representatives around the world
- Customer support by the engineers who developed the products
- Sample testing capability ensures our products work with customer's materials

OUR ADDED VALUE AND BENEFITS

- Saves time, effort, and expense
- Instruments and software are easy to use
- Sample preparation is simple
- Sensors are rugged and can be used in presses, molds, or ovens
- Samples can be applied to sensors in many forms
- Materials can be tested with production process configurations
- Materials can be tested under production process conditions
- Provides knowledge about cure state
- DEA measures the effects of chemistry and formulation
- DEA measures the effects of time, temperature and other process parameters
- DEA improves quality
- Allows same measurement in R&D, QA/QC, and manufacturing

MATERIALS

- Epoxies/Acrylics
- Polyurethanes/Polyesters/Polystyrenes/Polyvinyls
- Polyimides/Polyamides
- Bulk/Sheet/Epoxy Molding Compounds (BMC/SMC/EMC)
- Paints and coatings
- Graphite/glass-epoxy composites
- Composites and laminates



PROCESSING ENVIRONMENTS

- Ovens
- Presses
- Autoclaves
- Pultruders and extruders
- Batch reaction vessels



APPLICATIONS

- Formulation and reaction rate studies
- Cure and process development
- Water and solvent diffusion tests
- UV cures
- Dental adhesives
- Optical adhesives
- Photoresists
- Nondestructive materials tests
- Rheology
- Research and development
- Quality assurance/quality control
- Statistical quality control
- Manufacturing



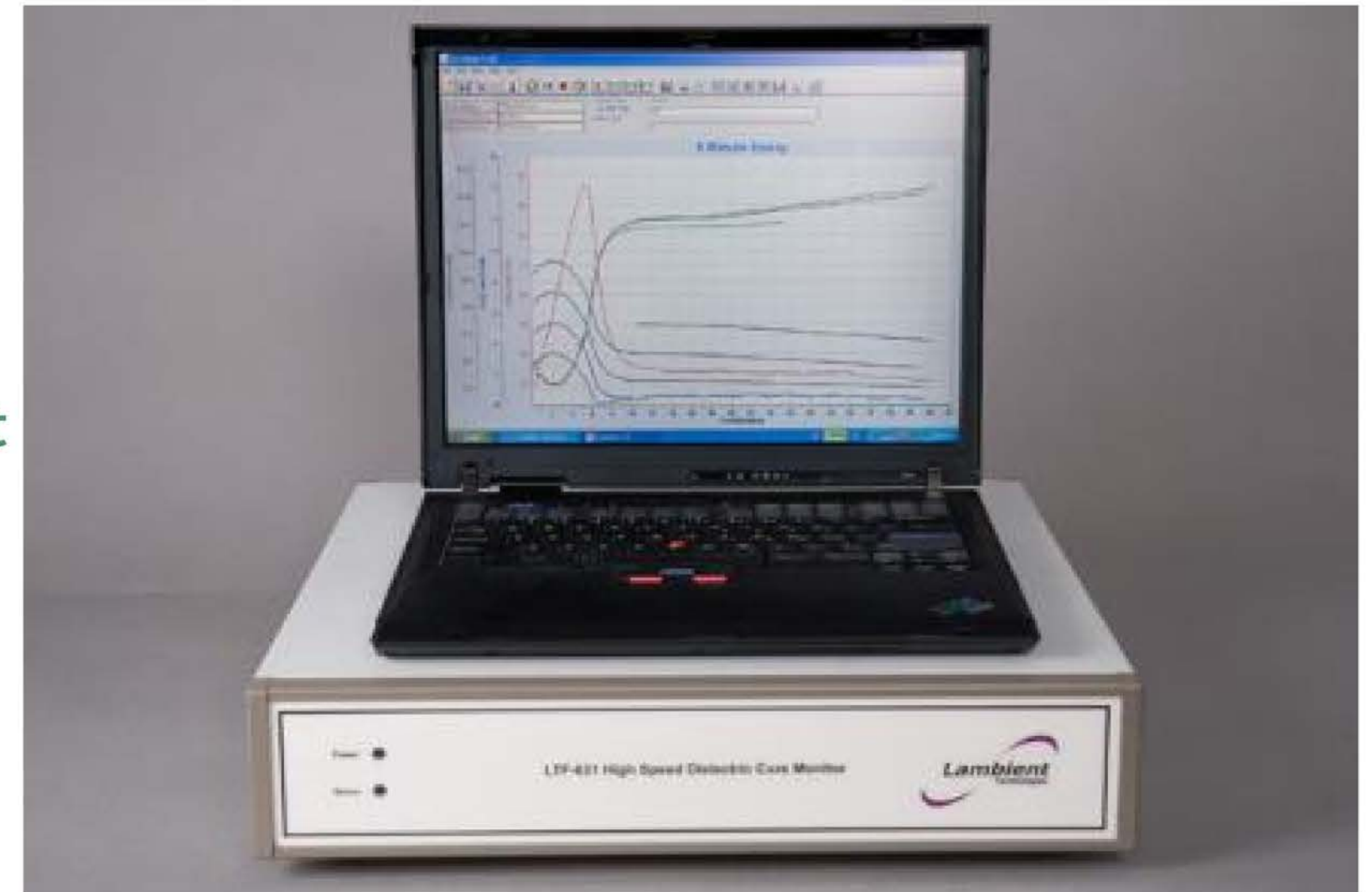
LT-451 DIELECTRIC CURE MONITOR: *OPTIMIZED FOR R&D*

- Wide excitation frequency range
 - 0.001 Hz to 100 kHz
- Available with 1, 2, or 4 channels
 - Each channel has 1 dielectric and 1 thermocouple input
- Two digital start/trigger inputs, two digital outputs
- Four analog inputs (± 10 VDC range)
- RS-232 communications or USB with converter
- CureView data acquisition and analysis software



LTF-631 HIGH SPEED DIELECTRIC CURE MONITOR: *OPTIMIZED FOR QA/QC*

- Excitation frequencies
 - 10 Hz, 100 Hz, 1 kHz, 10 kHz
- Available with 1, 2, or 4 channels
 - Each channel has 1 dielectric and 1 thermocouple input
- Two digital start/trigger inputs, two digital outputs
- Maximum measurement speed is 50 ms/data point
- RS-232 communications or USB with converter
- CureView data acquisition and analysis software



LT-440 DIELECTRIC CHANNEL: OPTIMIZED FOR MANUFACTURING

- Frequency range—1 Hz to 100 kHz
- Available with 1 channel only
 - Each channel has 1 dielectric and 1 thermocouple input
- Two digital start/trigger inputs, two digital outputs
- RS-232 or RS-485 communications or USB with converter
- CureView data acquisition and analysis software
- Multiple LT-440 units may be connected on a single RS-482 line



LTP-250A MICROPRESS

- Independent temperature control of upper and lower platens
- Temperature range: ambient to 350 °C with optional temperature controller
- Maximum applied force: 1500 pounds
- Platen dimensions: 3" x 3"
- Communicates with computer via RS-485 or USB with converter



CERAMICOMB 1" REUSABLE CERAMIC SENSOR



- For use in presses, molds or harsh environments
- May be flush mounted in platen or mold
- Electrodes embedded in alumina substrate
- Thermocouple below ceramic surface
- Stainless steel sheath with a nominal 1.0" (2.54 cm) diameter
- Maximum operating temperature 250 °C

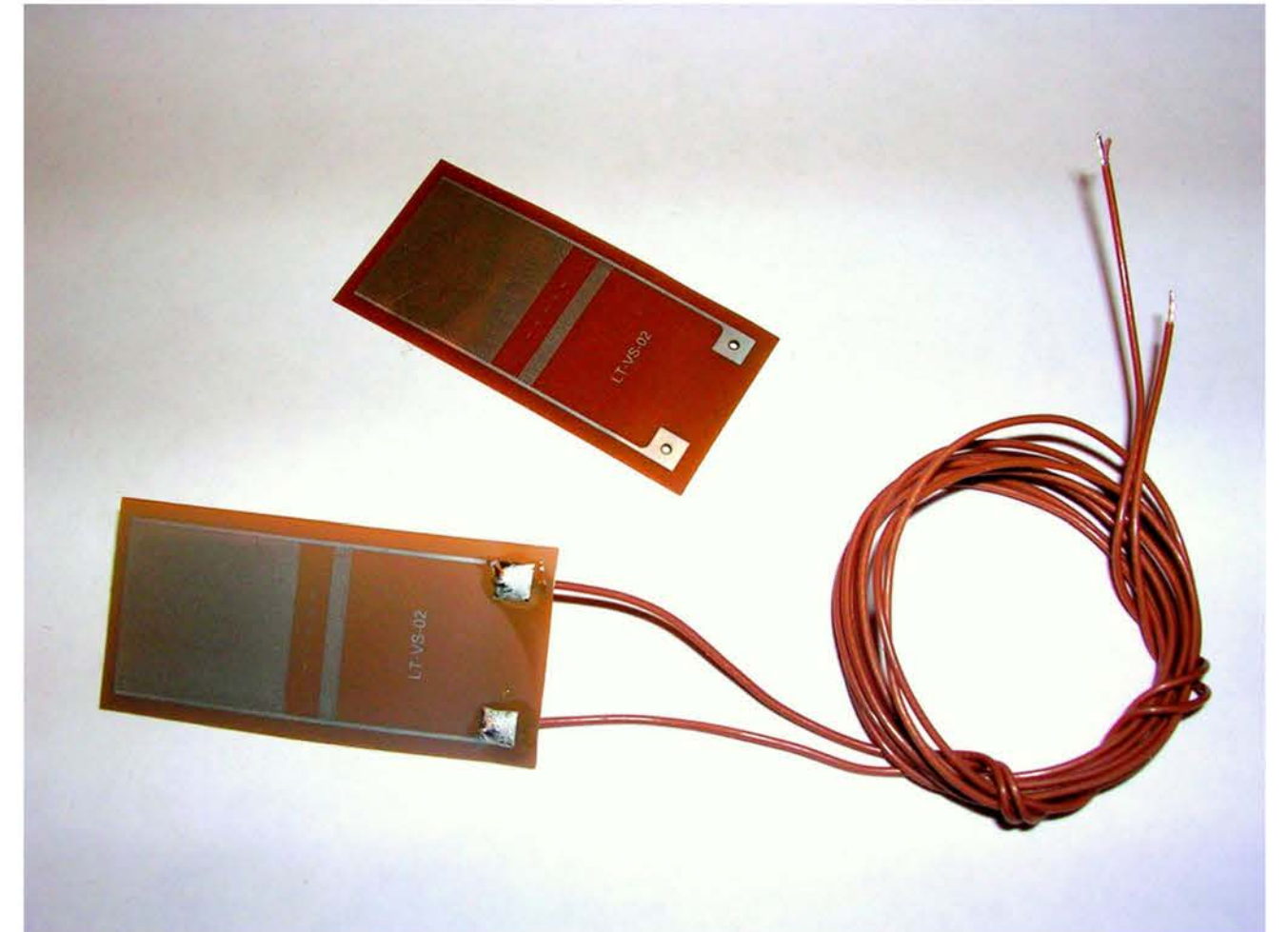
UNITRODE (SINGLE ELECTRODE) REUSABLE SENSORS



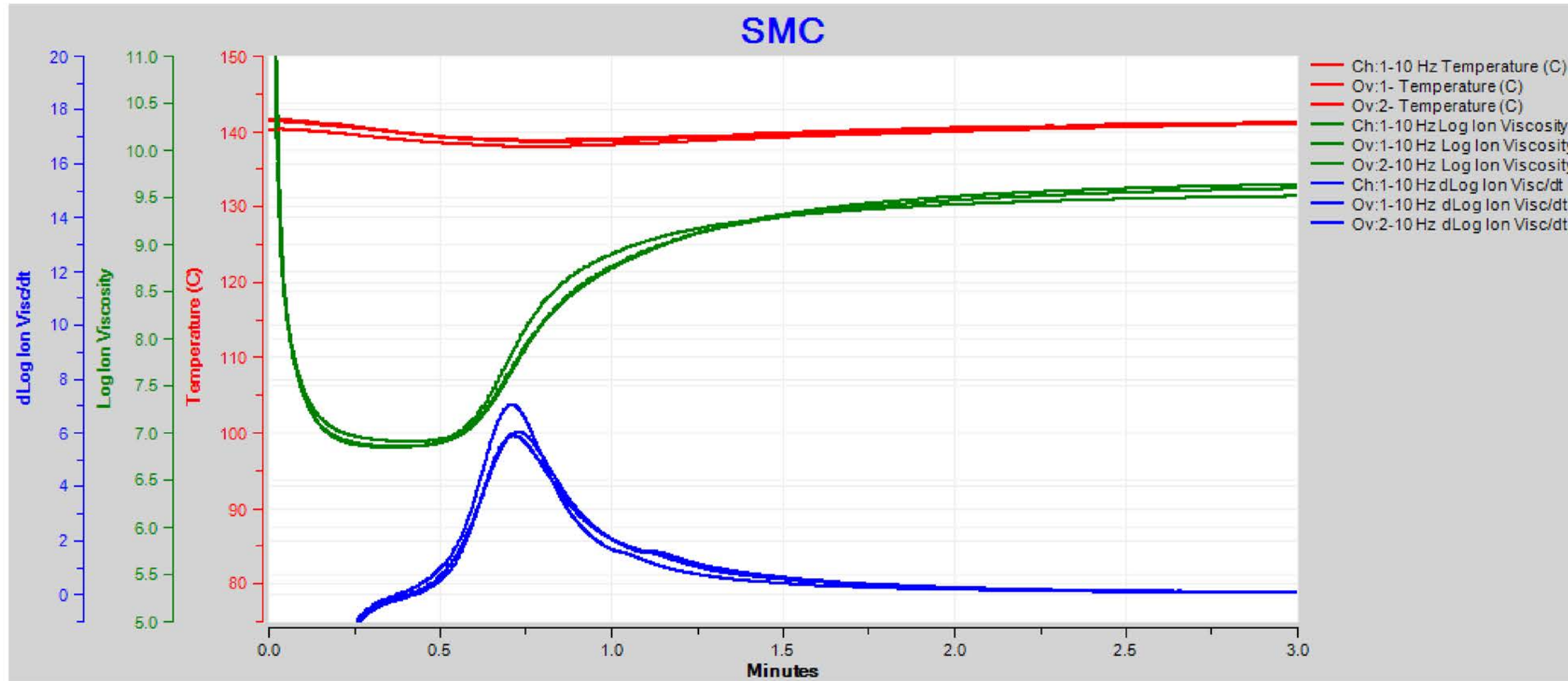
- For use in presses, molds or harsh environments
- May be flush mounted in platen or mold
- Electrodes embedded in high temperature thermoplastic substrate
- Unitrode-1": Stainless steel sheath with a nominal 1.0" (2.54 cm) diameter
 - Maximum operating temperature 250 °C
- Unitrode-10 mm / Unitrode-6 mm without sheath
 - Maximum operating temperature 200 °C

MINI-VARICON DISPOSABLE SENSOR

- Inexpensive
- Electrodes on thin, flexible Kapton substrate
- Electrode array allows choice of two sensitivities
- 1.5" (3.8 cm) length
- 0.004" (100 μm) thickness
- Surface measurement of dielectric properties
- Maximum operating temperature 350 °C without leads,
200 °C with leads



CUREVIEW DATA ACQUISITION AND ANALYSIS SOFTWARE



Three consecutive tests of SMC to study repeatability of material

Plot shows ion viscosity (green), slope of ion viscosity (blue) and temperature (red)

- Flexible and powerful data analysis capabilities
- For R&D, QA/QC and manufacturing
- Characterizes cure curves with Critical Points for SQC analysis

QUESTIONS? WE'RE HERE TO HELP.



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