Assessing Material Consistency Using MCC

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By the Numbers

In 2014 –

- **Nearly 22 billion marks were applied to products**
- **97,237 product evaluations**
- **> 20,000 product categories**
- **> 900,000 components**
- **> 80,000 plastics**

Standards


Research


Education


Environment


Life & Health


Workplace Health & Safety


Consumer Electronics


Data Security & Payments

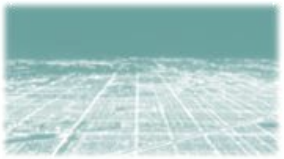

Transit


Textiles, Apparel & Footwear

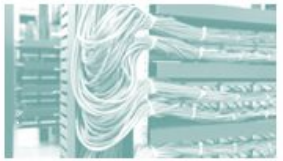

Toys & Juvenile Products


Appliances, HVAC/R, Lighting


Building & Life Safety Technologies


Energy & Industrial Systems


Performance Materials


Wire & Cable

UL Yellow Card

Component - Plastics E45329

SABIC INNOVATIVE PLASTICS B V

EUROPE - RESIN, PLASTICSLAAN 1, BERGEN OP ZOOM 4612 PX NL

123R(f1)

Polycarbonate (PC), "Lexan", furnished as pellets

Color	Min Thk (mm)	Flame Class	HWI	HAI	RTI Elec	RTI Imp	RTI Str
ALL	0.75	HB	-	-	120	120	120
	1.0	HB	-	-	120	120	120
	1.5	HB	4	2	130	125	125
	2.0	HB					
	3.0	HB					

Comparative Tracking Index (CTI): 2

Dielectric Strength (kV/mm): -

High-Voltage Arc Tracking Rate (HVTR): 2

Dimensional Stability (%): 0

(f1) - Suitable for outdoor use with respect to exposure to Ult
746C.

NOTE - Material designation may be followed by a color nomenc
combination.

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings
flammability of plastic materials used in the components and parts of end-produc

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IEC and ISO Test Methods

Test Name	Test Method	Units	Thickness Tested (mm)	Value
Flammability	IEC 60695-11-10	Class (color)	0.75	HB75 (ALL)
			1.0	HB75 (ALL)
			1.5	HB75 (ALL)
			2.0	HB75 (ALL)
			3.0	HB40 (ALL)
Glow-Wire Flammability (GWFI)	IEC 60695-2-12	C	1.0	850
			2.0	850
			3.0	900
Glow-Wire Ignition (GWIT)	IEC 60695-2-13	C	1.0	875
			2.0	850
			3.0	850
IEC Comparative Tracking Index	IEC 60112	Volts (Max)	-	-
IEC Ball Pressure	IEC 60695-10-2	C	-	-
ISO Heat Deflection (1.80 MPa)	ISO 75-2	C	-	-
ISO Tensile Strength	ISO 527-2	MPa	-	-
ISO Flexural Strength	ISO 178	MPa	-	-
ISO Tensile Impact	ISO 8256	kJ/m^2	-	-
ISO Izod Impact	ISO 180	kJ/m^2	-	-
ISO Charpy Impact	ISO 179-2	kJ/m^2	-	-

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UL's Compliance and Surveillance Program

Compliance

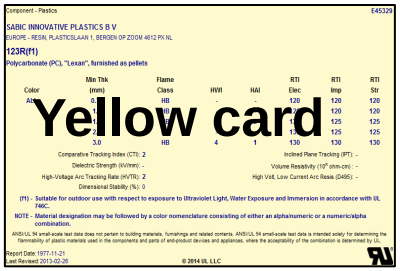
Follow-Up Service (FUS)

Certification

Surveillance

Surveillance

Surveillance



Follow-Up Service

Periodic surveillance of marked products to ensure ongoing validity of the demonstration of fulfilment of product requirements

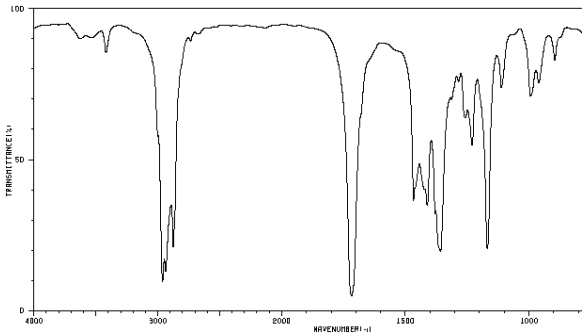
- Surveillance requirements are met
- Consistently applied for all certified clients
- Clients are satisfied with the value it brings

What type of surveillance shall be established?

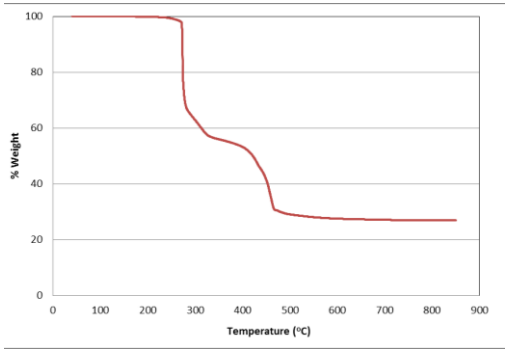
- Plastics: Sample testing + inspection
- Molders: Inspection

Follow-Up Service – Plastics

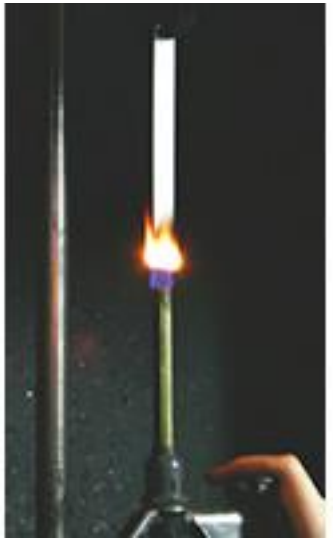
FTIR (chemistry)



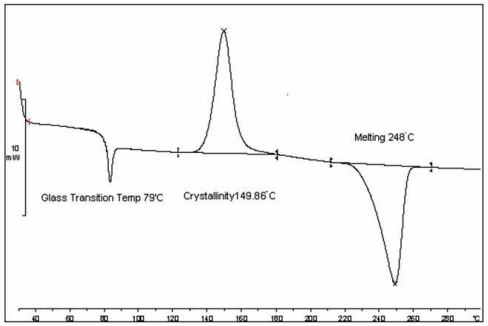
TGA (thermal degradation)



UL 94 Flame (flammability)



DSC (thermal transitions)



MCC (flammability)

UL’s MCC FUS Program

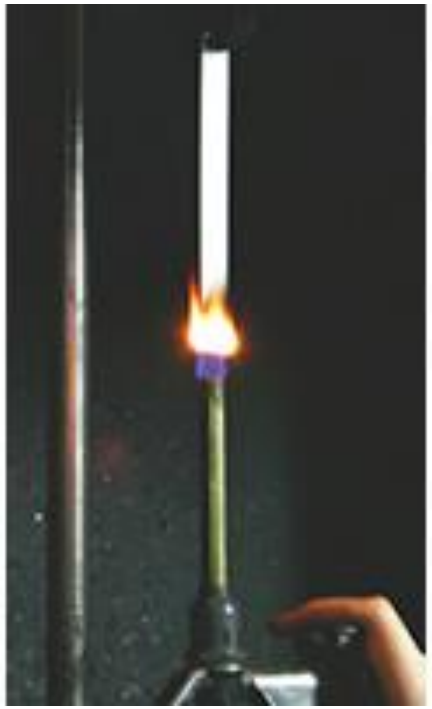
Traditional Flow Path for UL 94 Materials

Initial Certification

1. Mold flame bars
2. Ship flame bars to UL for Certification Testing
   - UL 94 flame testing
   - ID testing (FTIR, TGA, DSC)

Follow-Up Service

1. Mold flame bars
2. Ship bars to UL for FUS Testing
   - ID testing (FTIR, TGA, DSC)
   - UL 94 flame testing (if V-rated)



Alternate Flow Path for UL 94 Materials

Initial Certification

1. Mold flame bars
2. Ship flame bars and pellets to UL for Certification Testing
   - UL 94 flame testing
   - ID testing on pellets
   - MCC testing on pellets (if V-rated)

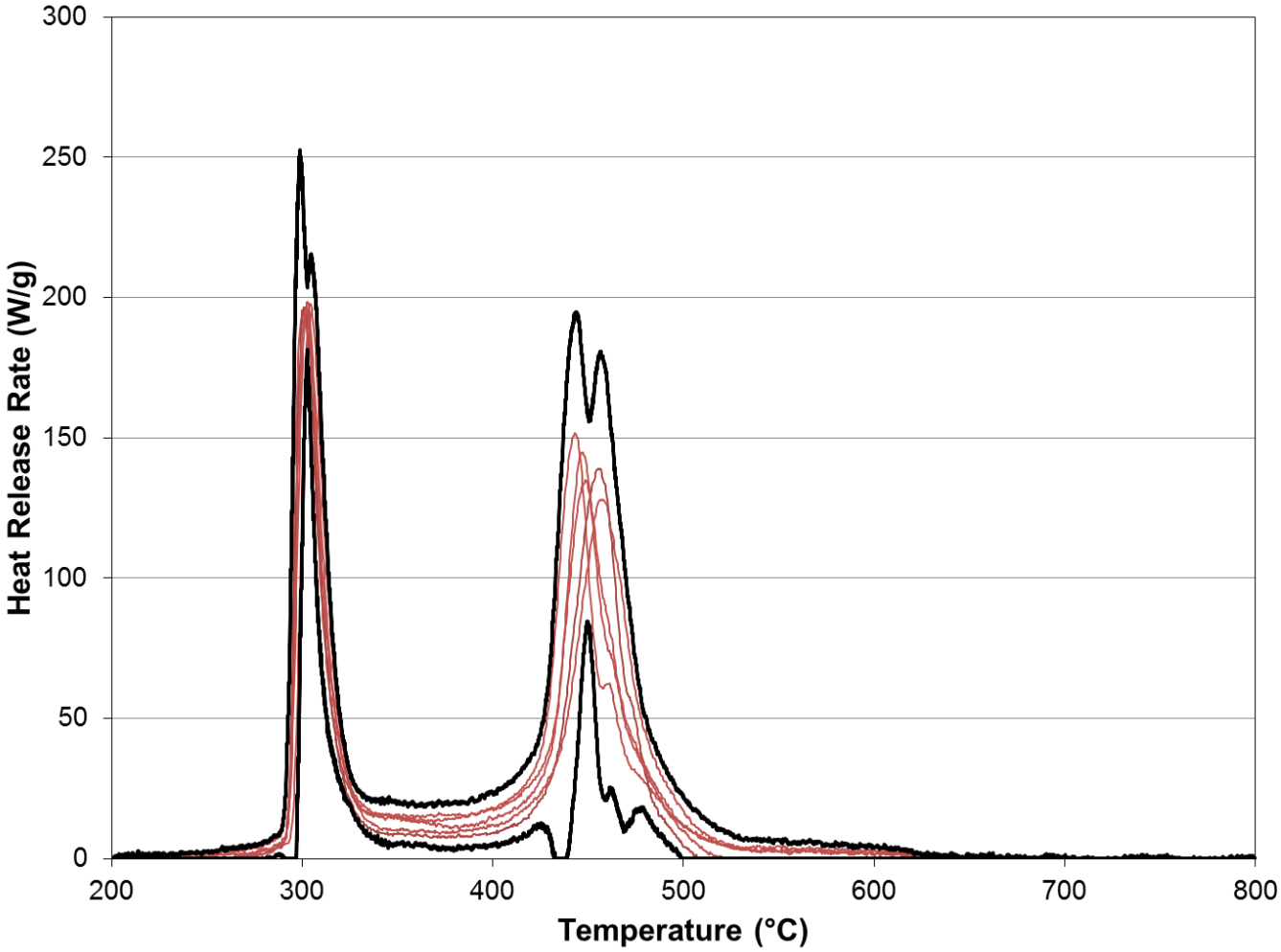
Follow-Up Service

1. ~~Mold flame bars~~
2. Ship pellets to UL for FUS Testing
   - ID testing
   - MCC testing (if V-rated)

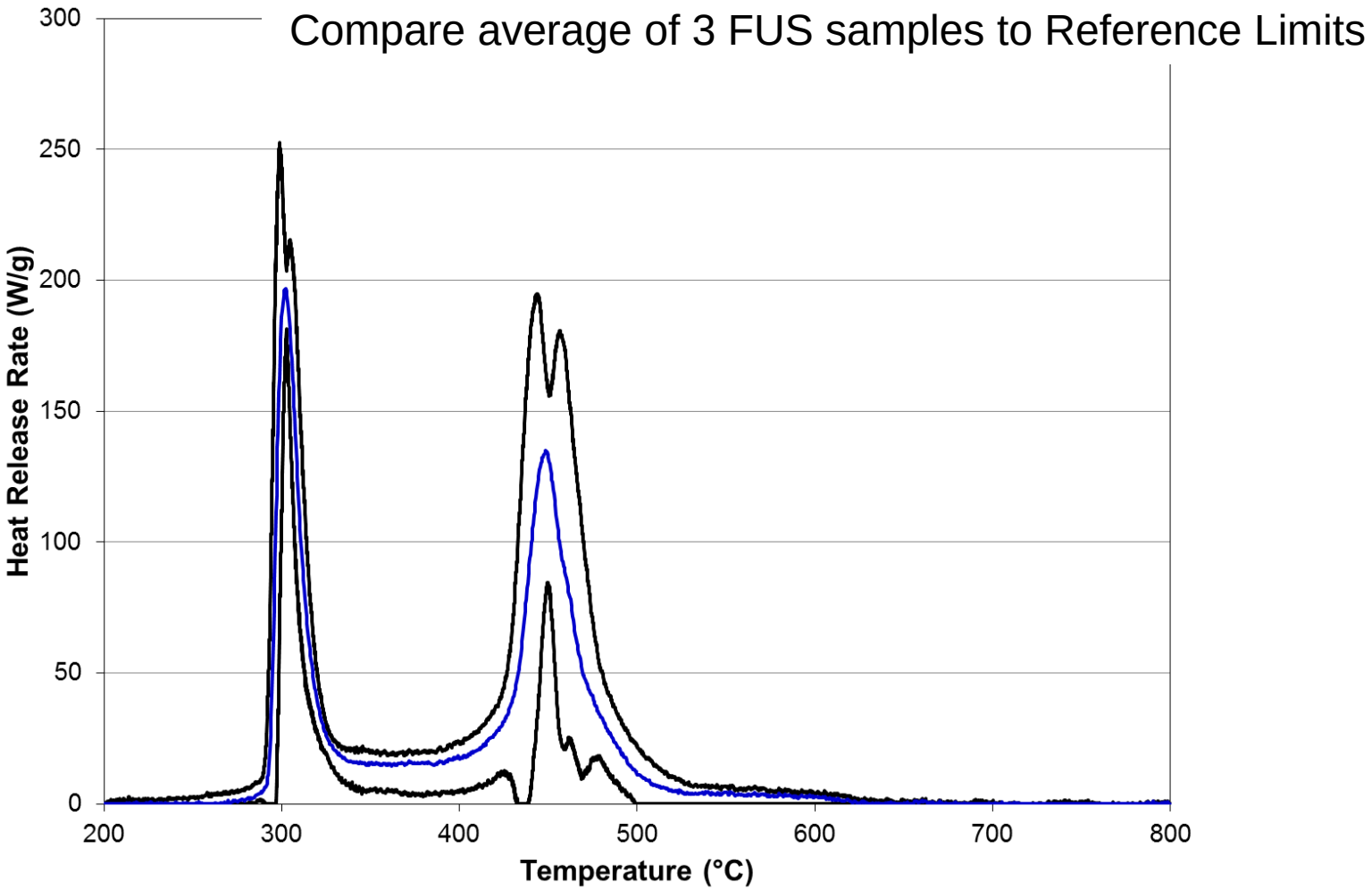
Options

1. ID and MCC testing can still be done on molded flame bars
2. Using multiple lots to establish references

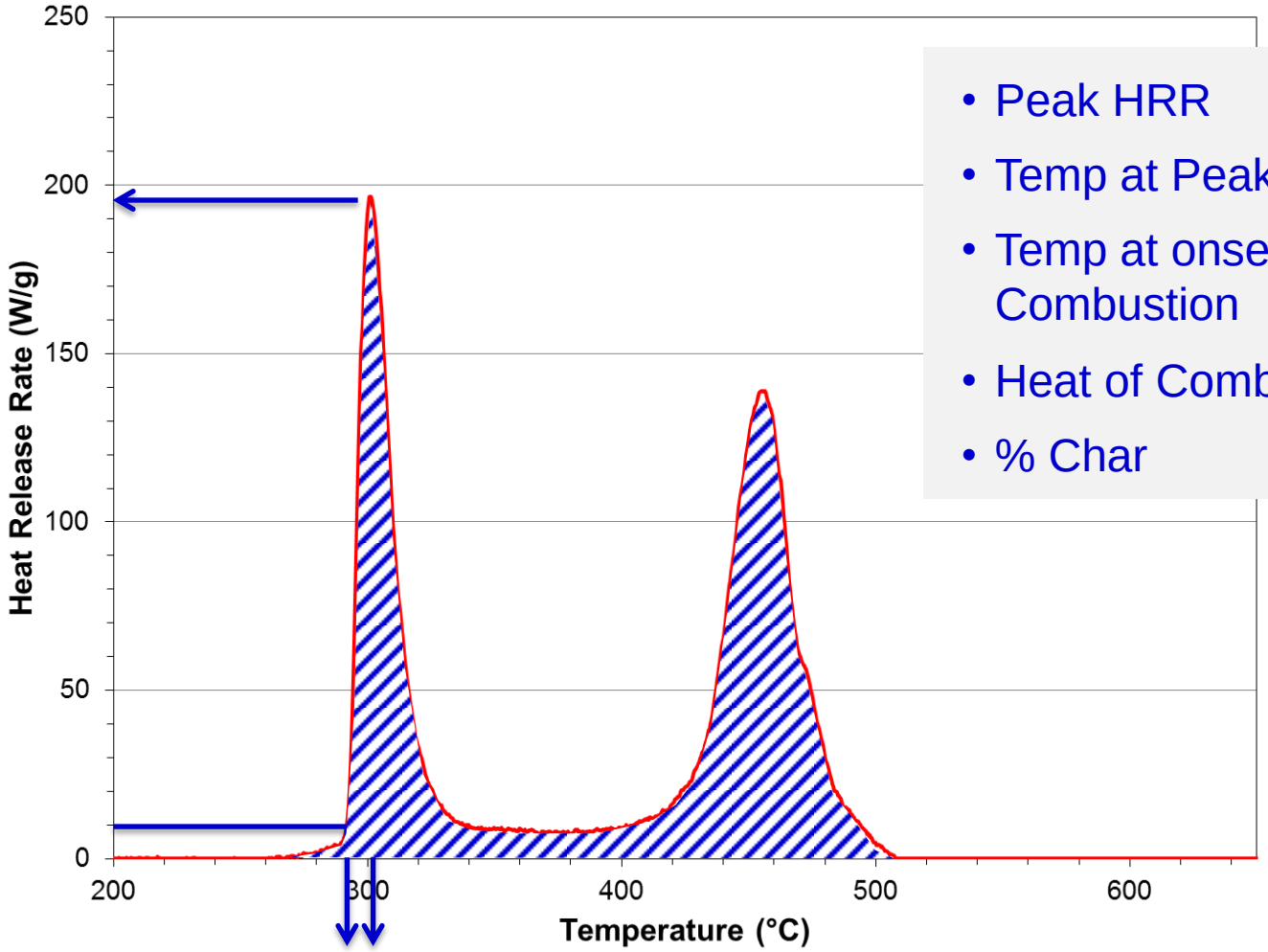
1. Establish Reference Limits



2. Confirm FUS Sample



3. Key MCC Characteristics



- Peak HRR
- Temp at Peak HRR
- Temp at onset of Combustion
- Heat of Combustion
- % Char

Determining Conformance

- MCC ← Combustion fingerprint

Statistical tolerance

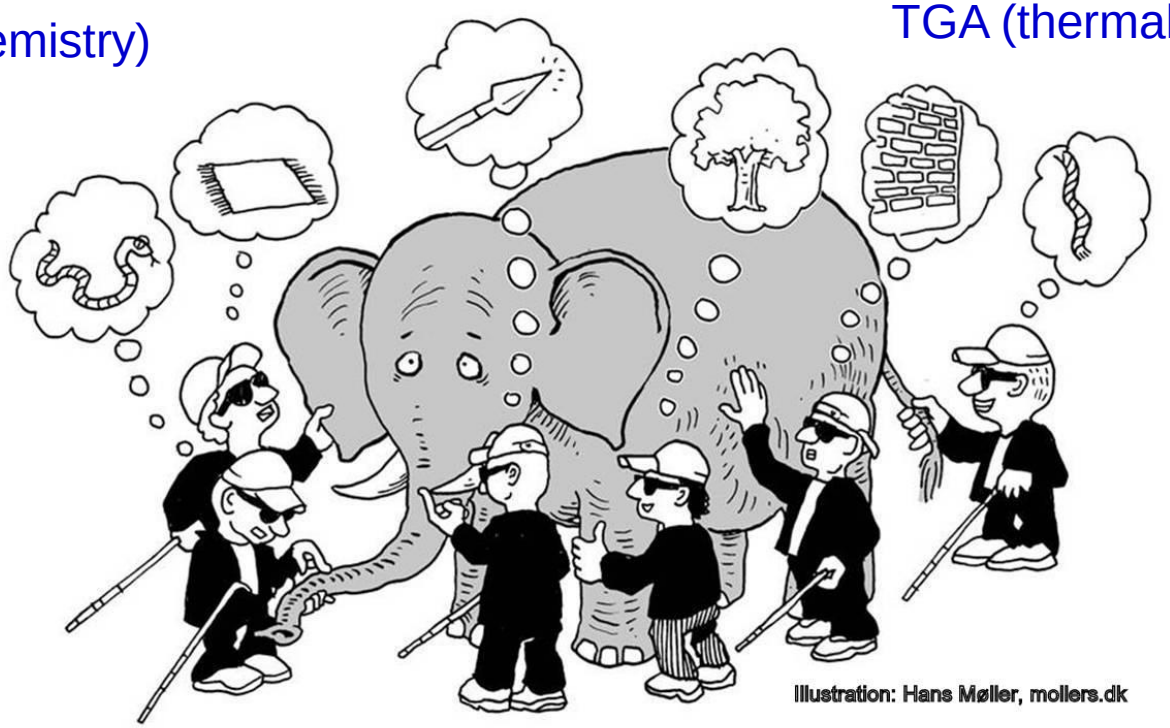
- (UL 94) ← Flammability
- DSC ← Thermal transition fingerprint
- TGA ← Thermal degradation fingerprint
- FTIR ← Chemical fingerprint

Fixed or relative tolerances

Judging Nonconformance

FTIR (chemistry)

TGA (thermal degradation)



DSC (thermal transitions)

UL 94 Flame (flammability)

MCC (flammability)

THANK YOU.

Questions?