Rose Consulting
Materials Consulting and Thermal Analysis Laboratory

September 9, 2005

Richard Treanor
Pacific Housing Systems
156 Estates Drive
Danville, CA 94526

RE: Thermomechanical Analysis (TMA) of Waffle Mat Samples

Dear Rich:

The TMA testing for softening point determination of the three waffle mat samples has been completed. Samples were labeled *Standard Reprocessed PP, Impact Modified PP,* and *White PP.* Appropriate sized specimens were cut from the same corner of each box and tested in a Perkin-Elmer TMA7 from 15°C to 175°C using a 5°C per minute heating rate with a 25mN preload applied. All testing was done in a dry helium environment.

TEST RESULTS

The TMA results are tabulated below for your convenient review. The data is the softening point taken as the onset temperature indicated on the plot. The melting point of all samples is over 160°C (≈162°C-163°C) and is shown on the plot where the probe height drops dramatically.

Sample ID	Softening Point (°C)
Standard Reprocessed PP	148.60
Impact Modified PP	118.79
White PP	149.36

The *White PP* appears to be the "most uniform" in that it has a nearly constant rate of expansion while the *Standard Reprocessed* exhibits a subtle relaxation (possibly some degree of softening) around 40°C and the *Impact Modified PP* exhibits a fairly sharp expansion at 118°C (likely due to the ethylene impact modifier).

The comparison plot shows the normalized expansion data for the three materials and from a practical perspective shows the *Standard Reprocessed and White PP* samples to be nearly identical while the *Impact Modified PP* has, as expected, a greater expansion rate with temperature. That said, the *Standard Reprocessed PP* is comparable and sufficient if adequately stabilized for the thermal exposures generated in the molding process and the solar thermal and UV exposures during shipping/storage and installation.

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Please review the data and report carefully. Don't hesitate to call me with any questions you may have. The data is emailed this date with emailed copies to Tom Richards and Dick Spratling of KS Plastic as you requested.

Thank you for the opportunity to serve Pacific Housing Systems.

Sincerely,

John E. Rose
President

Enc: TMA plots

cc: Tom Richards, trichards@pacifichousingsystems.com
Dick Spratling (KS Plastic), dspratling@ksplastic.com

Filename:	C:\Program Files\Pyris...\PHSTMA090705a.tmd
Operator ID:	JER
Sample ID:	PHS - Wafflemat - Std Reprocessed PP
Measuring System:	Parallel Plate - Disc
Diameter:	3.000 mm
Height:	2.208 mm
Comment:	Tg/softening point - Inj. molded PP

PHS - Wafflemat - Std Reprocessed PP: PHSTMA090705a
Probe Position (mm) : Step: 1

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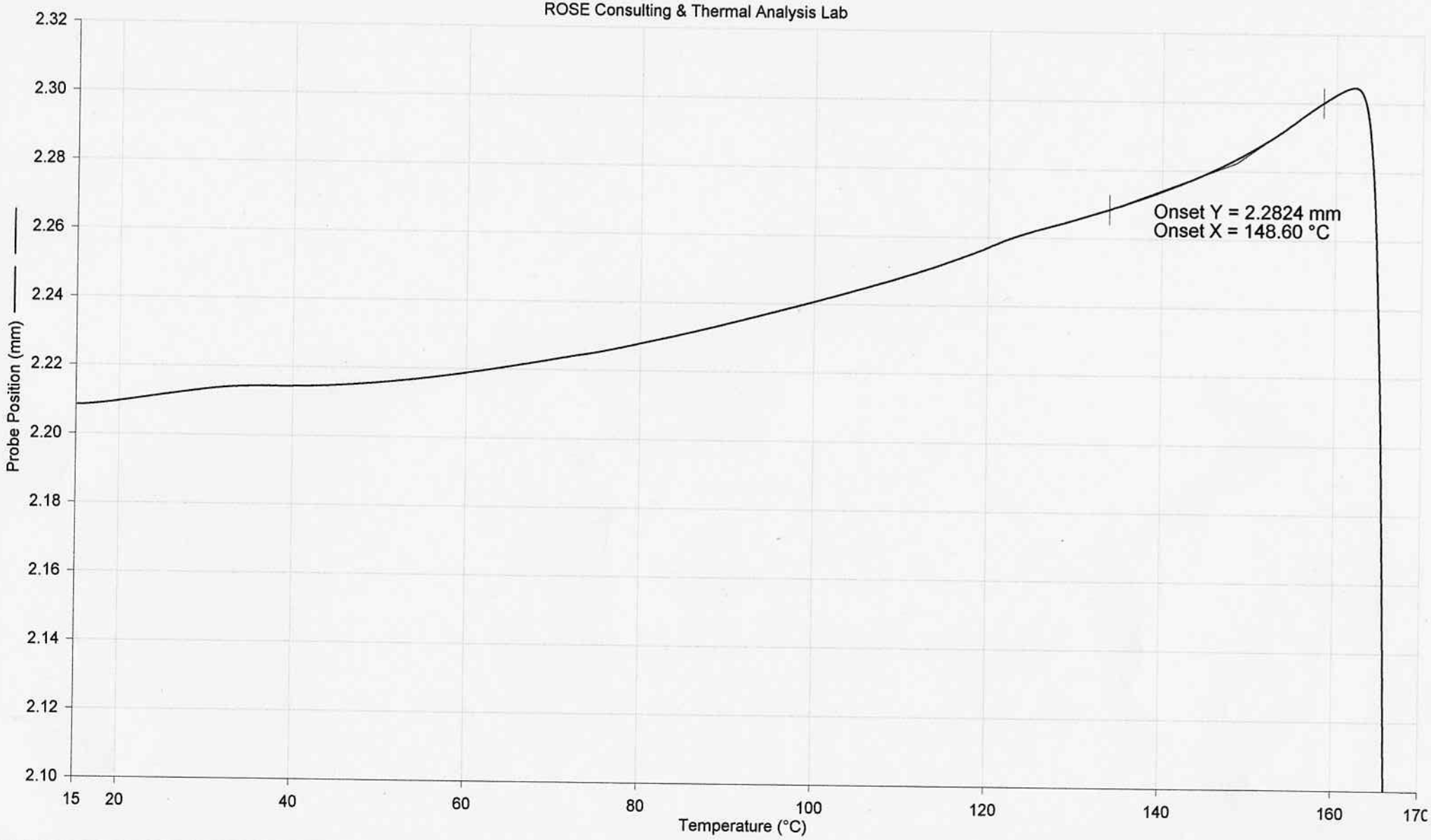

1) Heat from 15.00°C to 175.00°C at 5.00°C/min

Filename:	C:\Program Files\Pyris...\PHSTMA090705b.tmd
Operator ID:	JER
Sample ID:	PHS - Wafflemat - Impact Modified PP
Measuring System:	Parallel Plate - Disc
Diameter:	3.000 mm
Height:	2.157 mm
Comment:	Tg/softening point - Inj. molded PP

PHS - Wafflemat - Impact Modified PP: PHSTMA090705b
Probe Position (mm) : Step: 1

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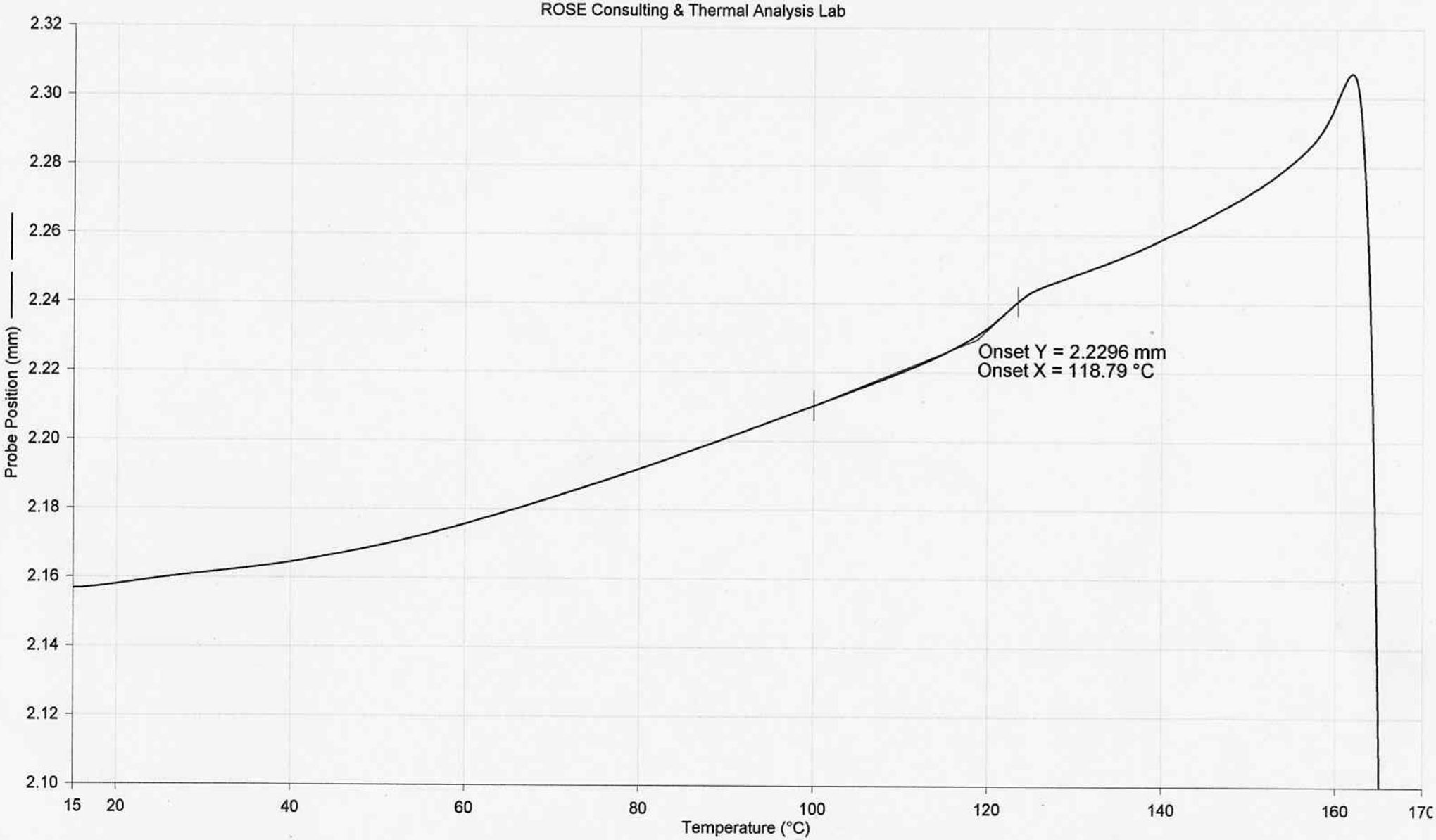

1) Heat from 15.00°C to 175.00°C at 5.00°C/min

Filename:	C:\Program Files\Pyris...\PHSTMA090705c.tmd
Operator ID:	JER
Sample ID:	PHS - Wafflemat - White PP
Measuring System:	Parallel Plate - Disc
Diameter:	3.000 mm
Height:	2.189 mm
Comment:	Tg/softening point - Inj. molded PP

PHS - Wafflemat - White PP: PHSTMA090705c
Probe Position (mm) : Step: 1

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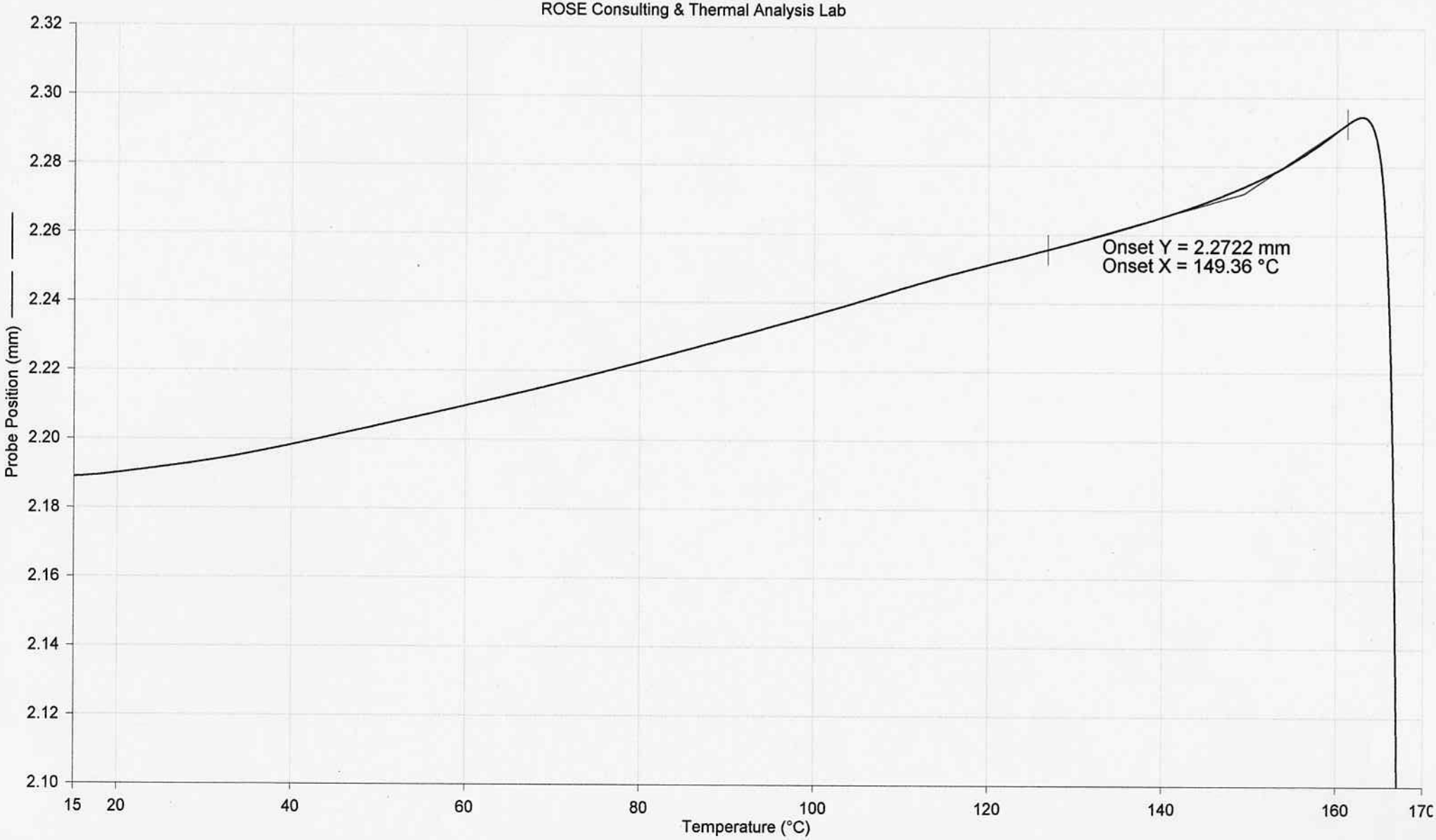


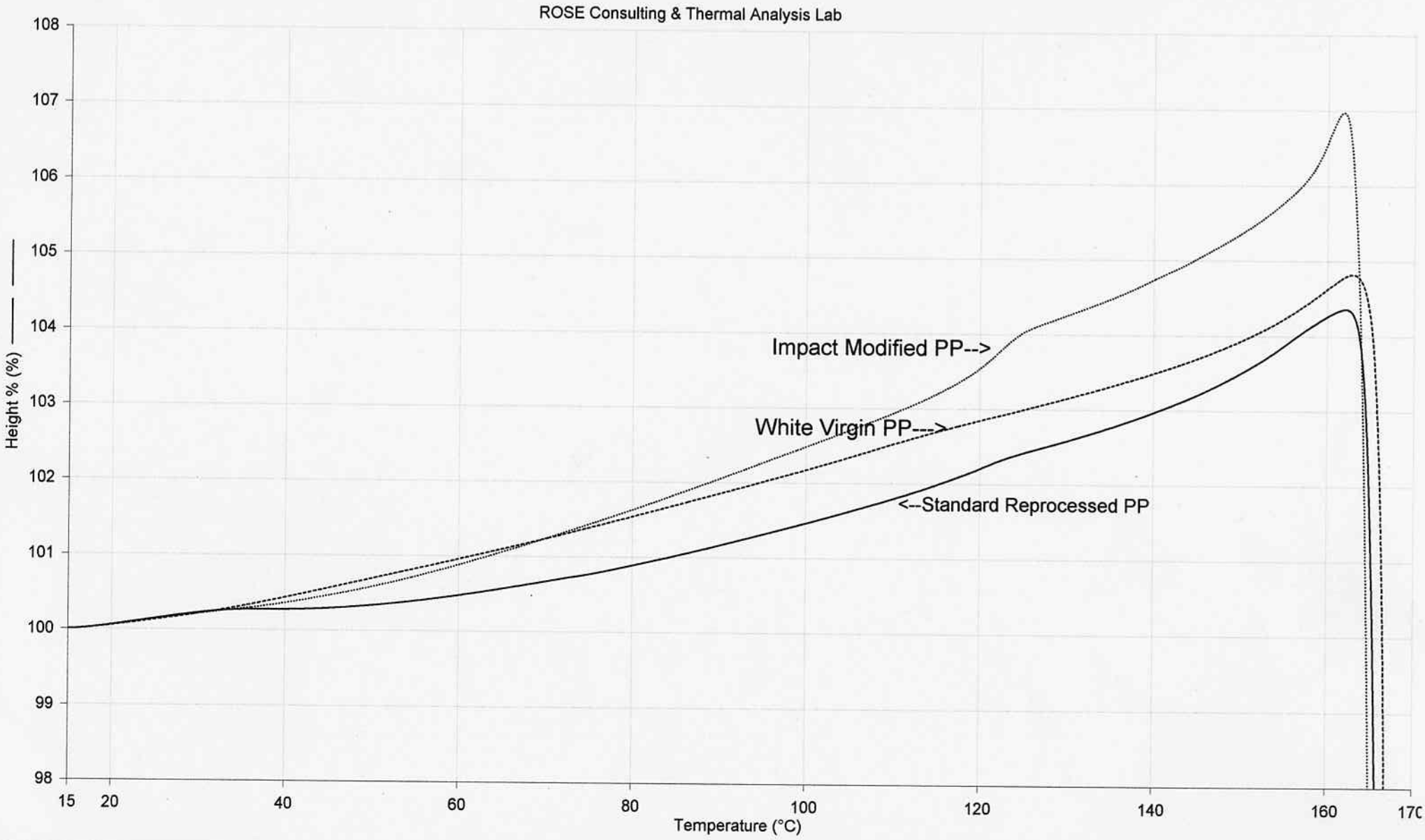
1) Heat from 15.00°C to 175.00°C at 5.00°C/min

Filename:	C:\Program Files\Pyris...\PHSTMA090705a.tmd
Operator ID:	JER
Sample ID:	PHS - Wafflemat - Std Reprocessed PP
Measuring System:	Parallel Plate - Disc
Diameter:	3.000 mm
Height:	2.208 mm
Comment:	Tg/softening point - Inj. molded PP

PHS - Wafflemat - Std Reprocessed PP: PHSTMA090705a
Height % (%) : Step: 1

PHS - Wafflemat - White PP: PHSTMA090705c
Height % (%) : Step: 1

PHS - Wafflemat - Impact Modified PP: PHSTMA090705b
Height % (%) : Step: 1



1) Heat from 15.00°C to 175.00°C at 5.00°C/min