Synthesis and Characterization of Polyhydroxyamide/Polymethoxyamides

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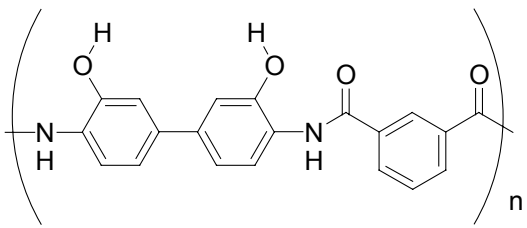
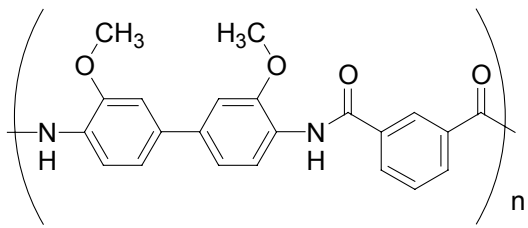
Outline

- Synthesis of PHA/PMeOA "smart" copolymers
- Thermal characterization of the copolymers
- Analysis of their potential to be thermally processed

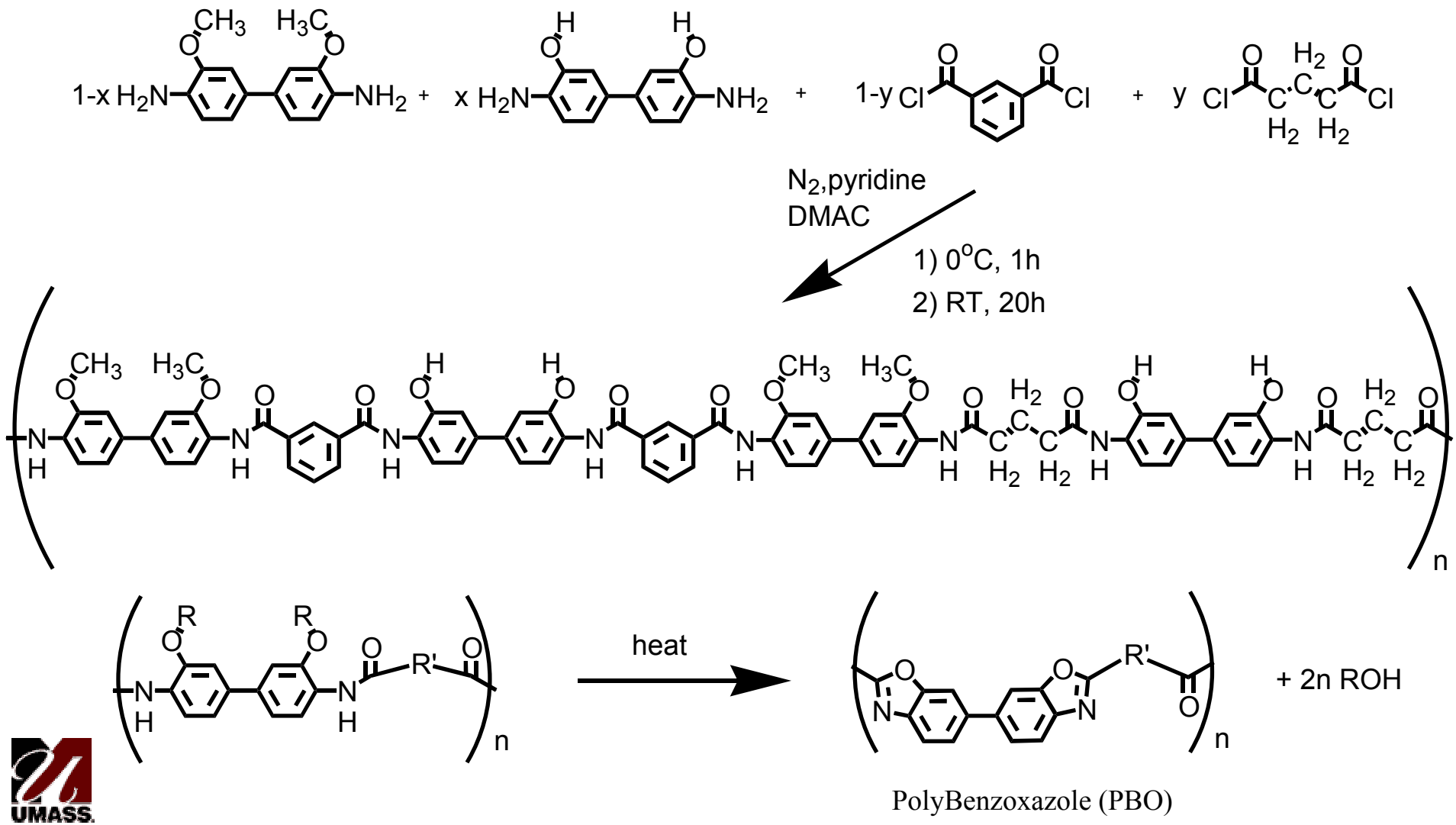


Poly(hydroxy-amide): PHA

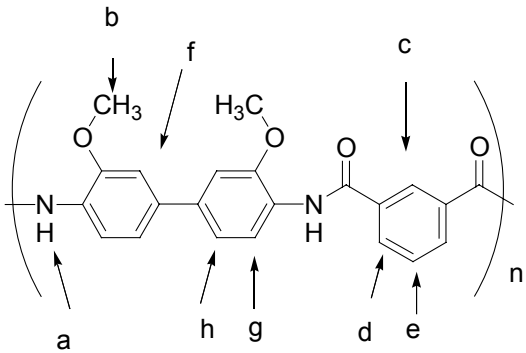


Poly(methoxy-amide): PMeOA

Synthetic Scheme for PHA/PMeOA "Smart" Fire-Safe Copolymers



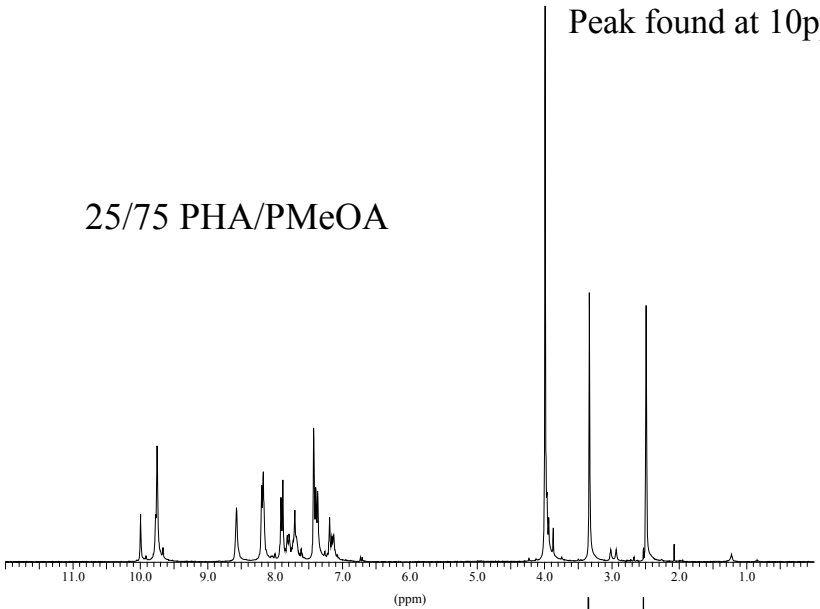
^{1}H NMR of PMeOA



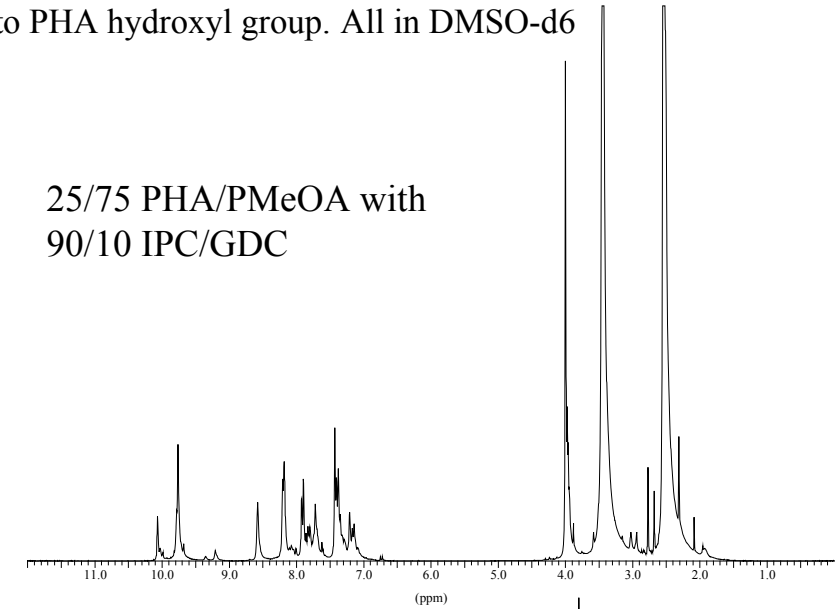
^{1}H NMR of PHA/PMeOA Copolymers

Peak found at 10ppm due to PHA hydroxyl group. All in DMSO-d6

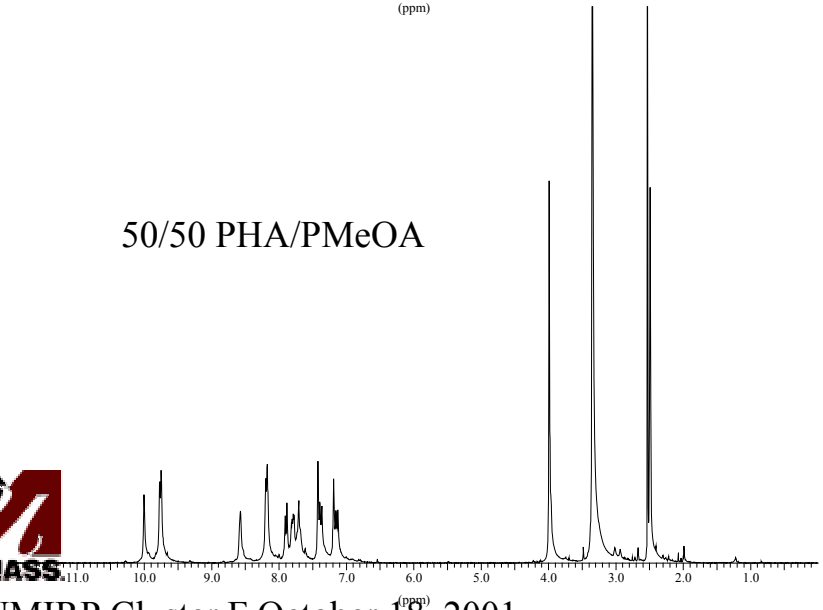
25/75 PHA/PMeOA



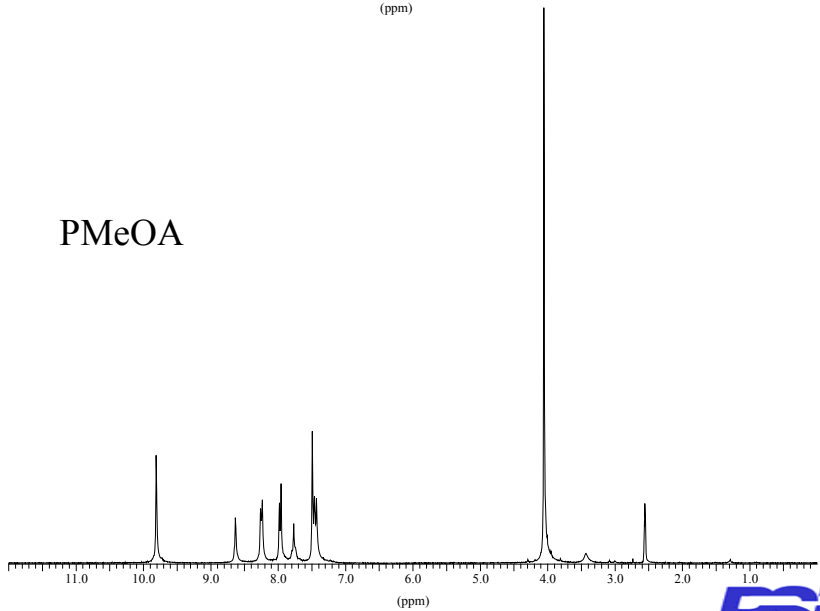
25/75 PHA/PMeOA with
90/10 IPC/GDC



50/50 PHA/PMeOA



PMeOA

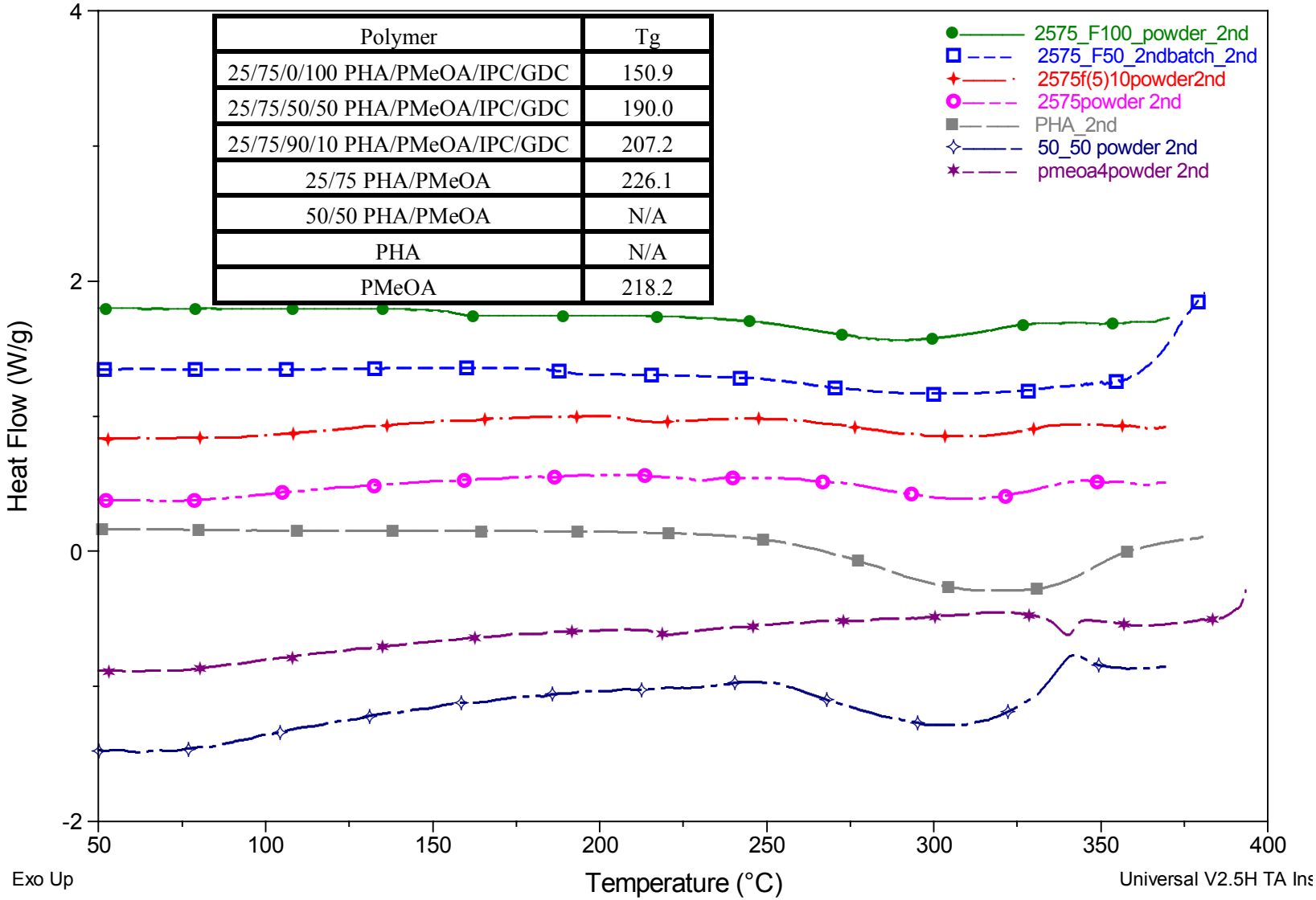


Microcalorimetry Data for Various Polymers

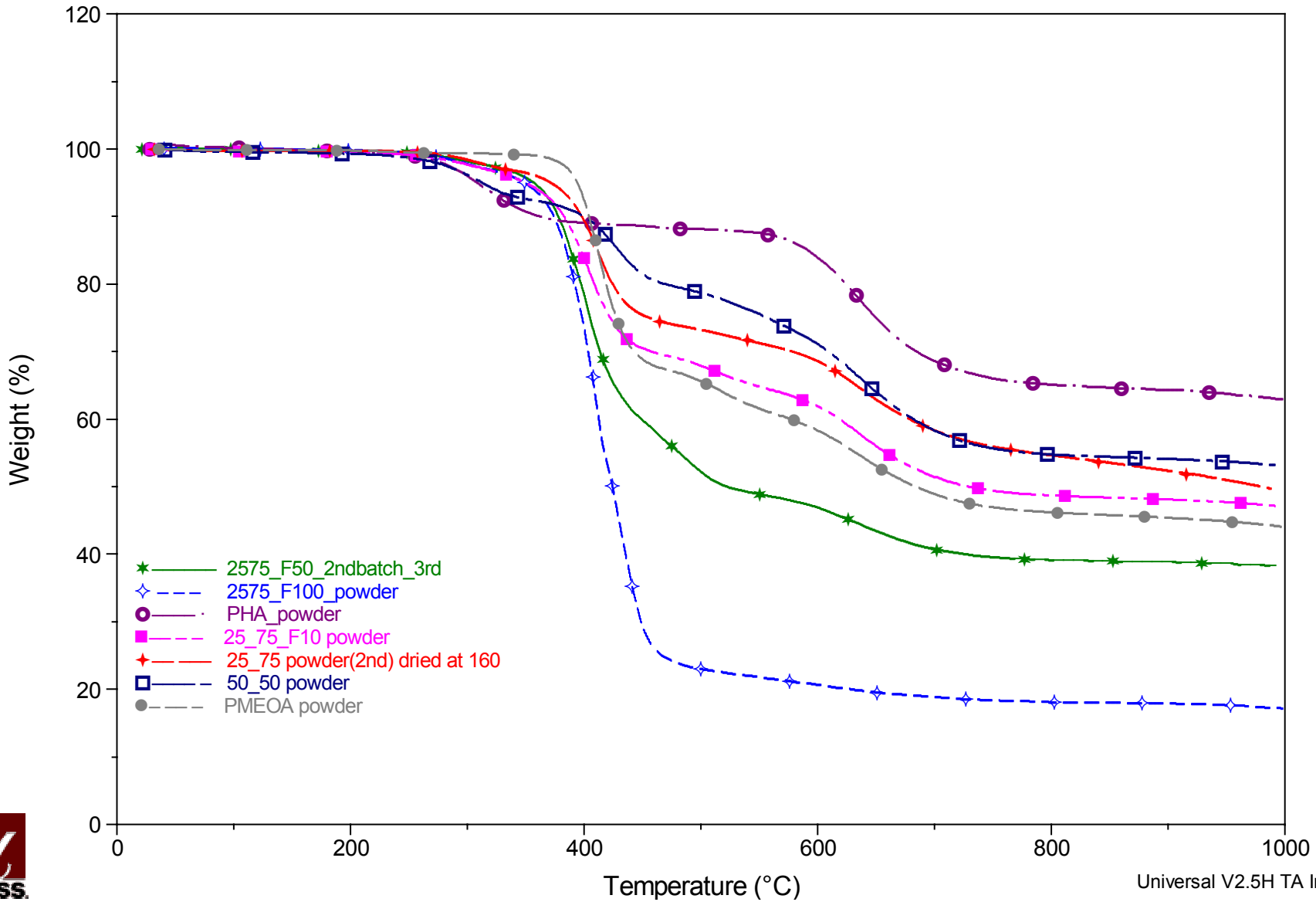
Polymer	Heat Release Capacity (J/g ·K)	Total Heat Release (kJ/g)
PE	1558	40.4
PC	382	19.3
Kevlar	292	15.2
PHA	42	10
25/75/100/0 PHA/PMeOA/IPC/GDC	50	11
25/75/90/10 PHA/PMeOA/IPC/GDC	66	12
25/75/50/50 PHA/PMeOA/IPC/GDC	224	16.3
25/75/0/100 PHA/PMeOA	450	20.4
50/50 PHA/PMeOA	33	11
PMeOA	130	17

DSC of PHA/PMeOA Copolymers

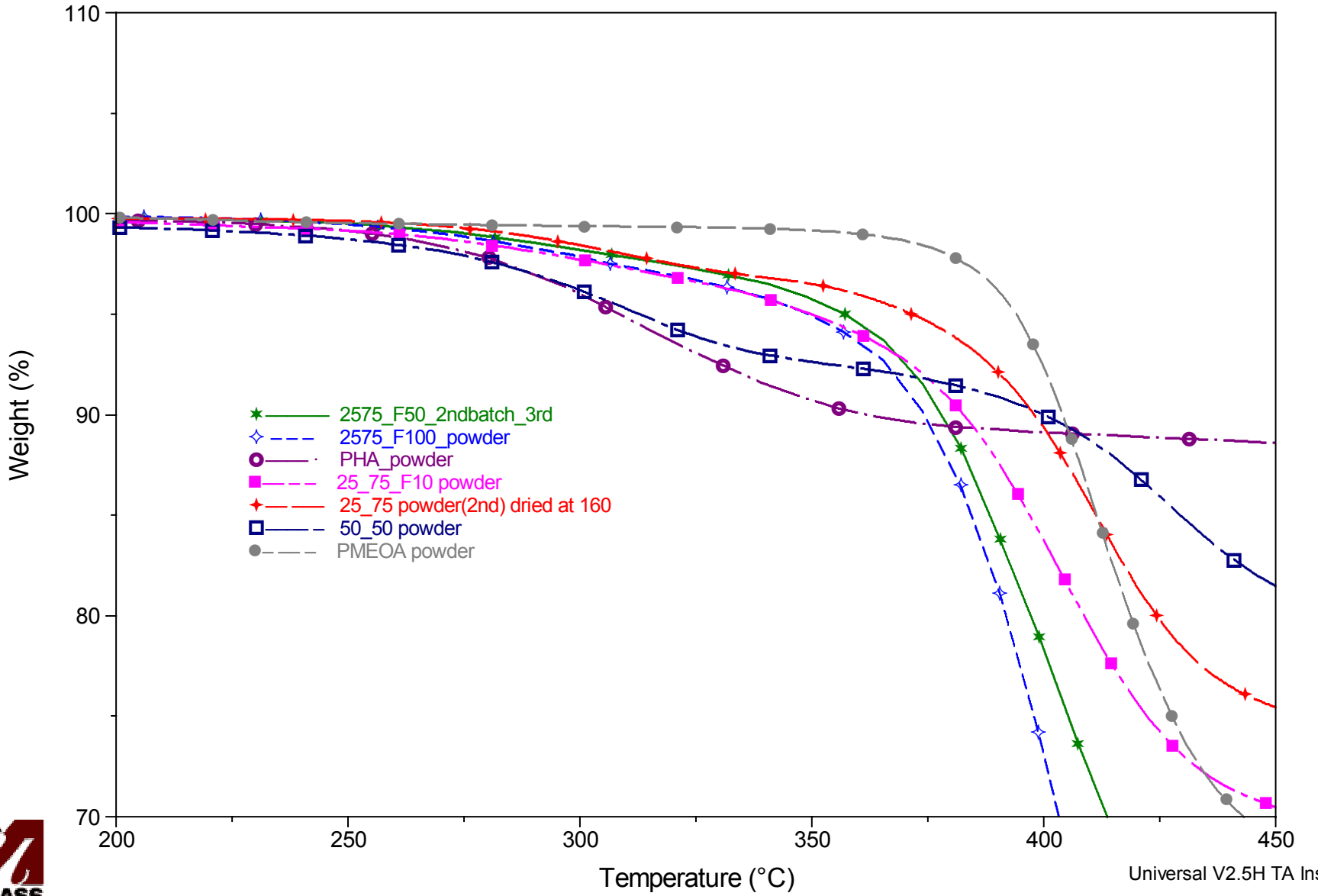
Polymer	Tg
25/75/0/100 PHA/PMeOA/IPC/GDC	150.9
25/75/50/50 PHA/PMeOA/IPC/GDC	190.0
25/75/90/10 PHA/PMeOA/IPC/GDC	207.2
25/75 PHA/PMeOA	226.1
50/50 PHA/PMeOA	N/A
PHA	N/A
PMeOA	218.2



TGA of PHA/PMeOA Copolymers

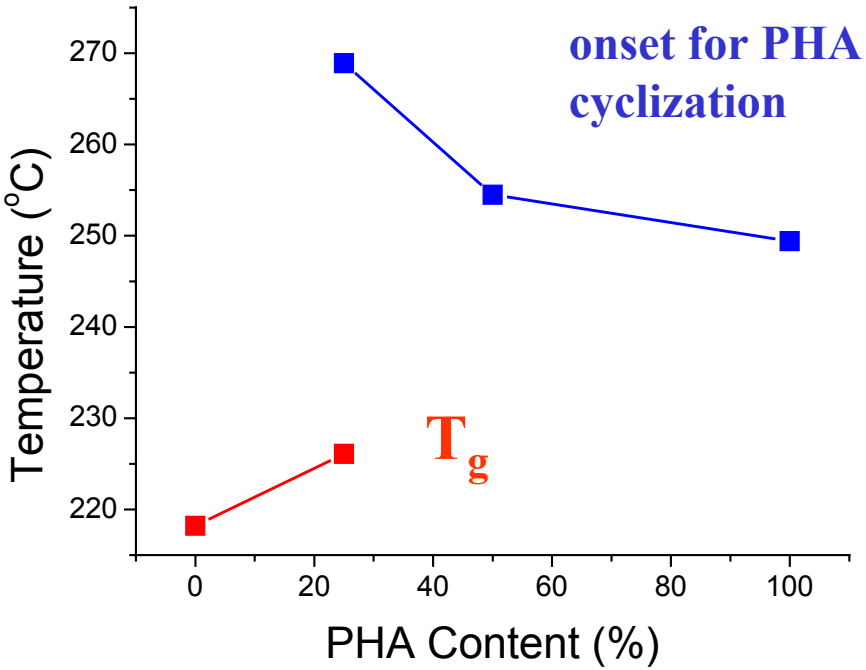


TGA of PHA/PMeOA Copolymers

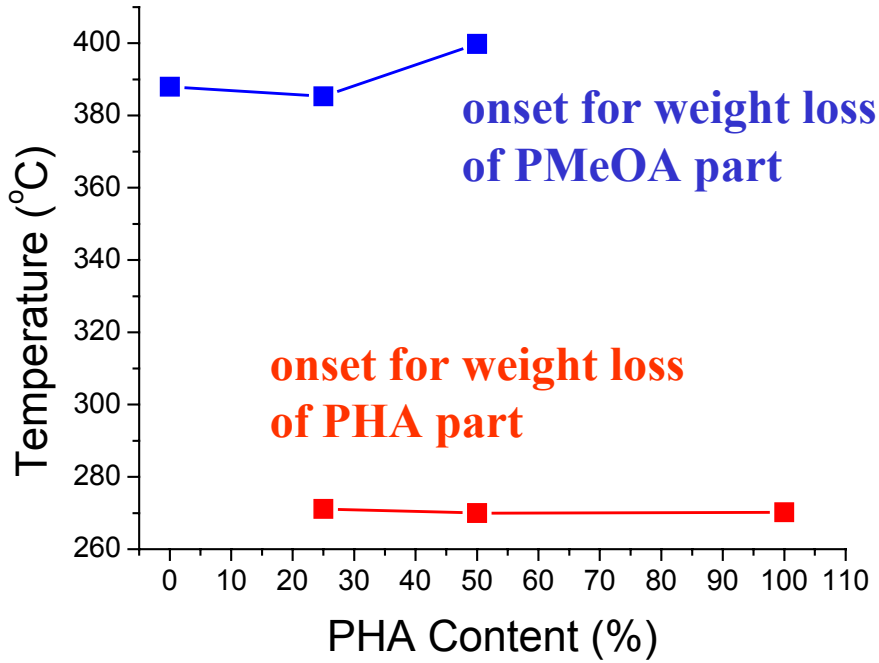


Thermal Characteristics of PHA/PMeOA Hybrid at different composition

Results from DSC

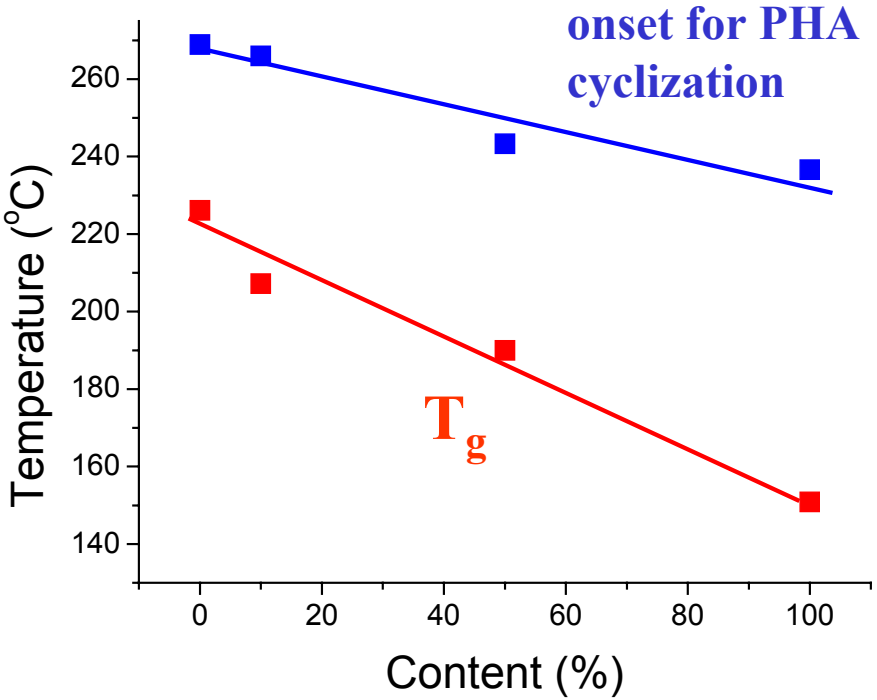


Results from TGA

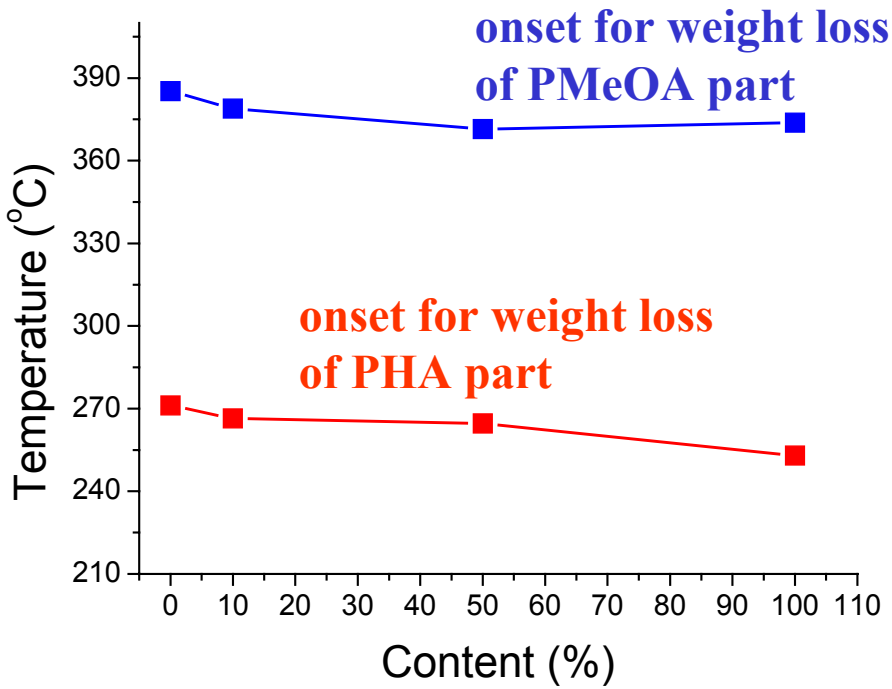


Thermal Characteristics of PHA/PMeOA/Flexible Hybrids with different Flexible part contents

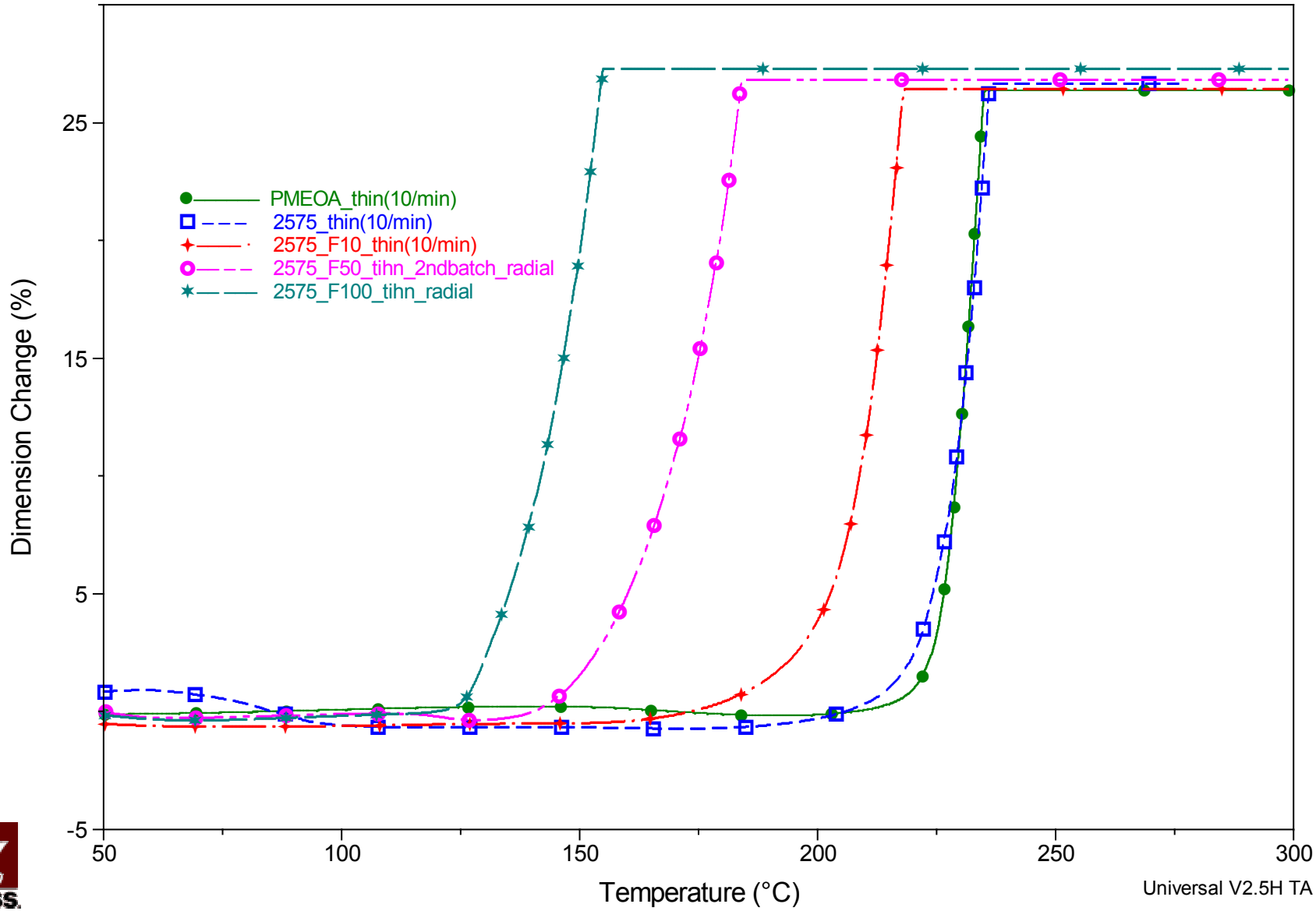
Results from DSC



Results from TGA

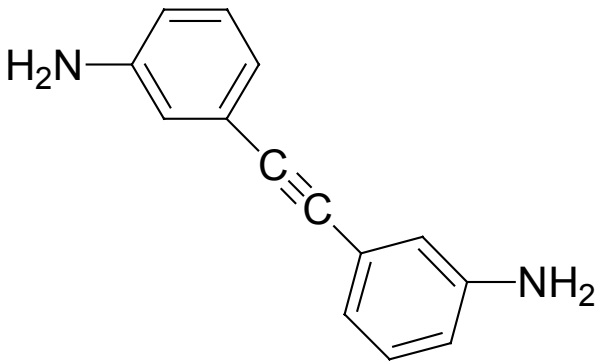


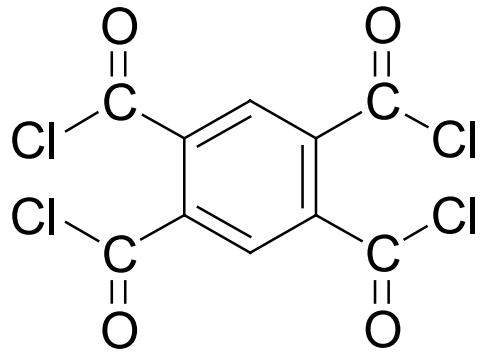
TMA of PHA/PMeOA Copolymers



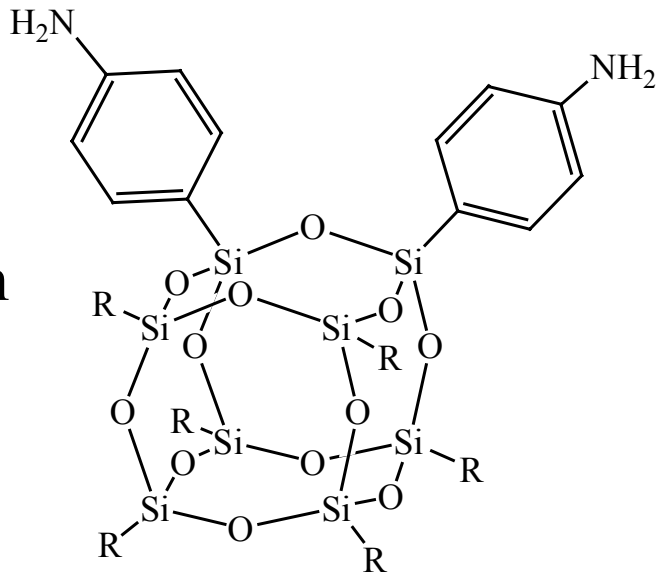
Other Possible Avenues

- Crosslinkers
  - Thermally Induced
  - Chemically Incorporated





Protective Surface Formation



Future Work and Acknowledgments

- Synthesize more flexible copolymers to optimize processability while retaining low heat release properties
- Optimize synthesis to obtain maximum molecular weight
- Conduct heat treatment studies to determine the effects of solvent and percent cyclization on the physical properties
- Melt spin fibers and examine their physical properties

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