

Towards a better understanding
of baking: An overview of
product characterization during
processing.

Shane Walker/Avi Goldstein

Baked Product Characterization

- Formulation, Process and Product are all important considerations
 - Consider ingredient interactions
 - Elements of process characterization
 - Attributes of the product
- Cookie and snack baking examples

Challenge to the Food Industry

- Reformulate old product lines to meet current health demands and regulations
 - Involves changing ingredient formulations
 - Need to produce products of similar quality to old formulations
- Difficult with all purpose shortening due to functionality derived from high saturated and trans fat contents
 - Solid Fat Index
 - Oxidative stability



MAG gel

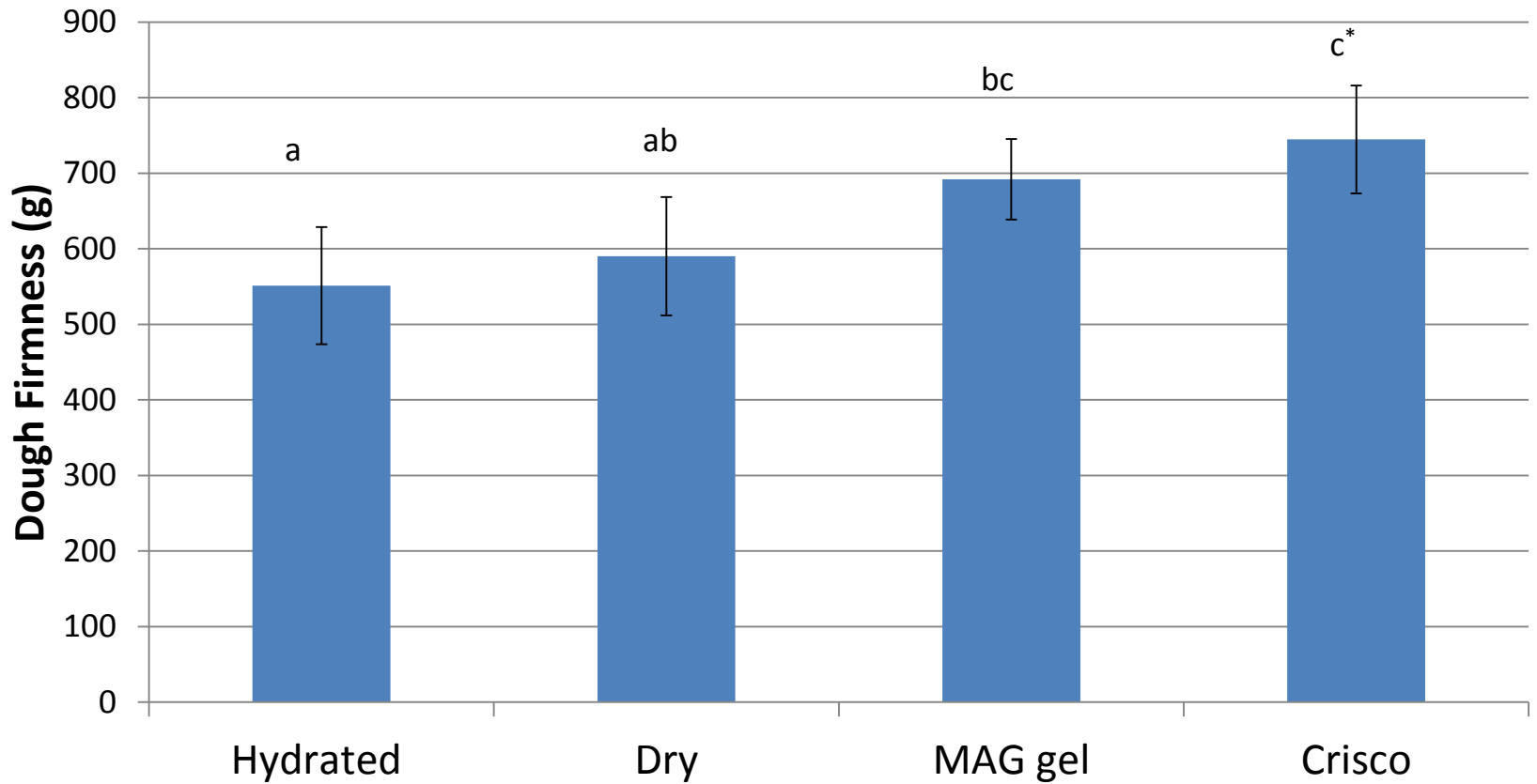
- Replace Crisco all-purpose shortening with novel shortening at 1:1 weight level
- Novel shortening 'MAG gel' composed of 55.2% oil, 40% water, 4.5% distilled monoglyceride, 0.3% stearic acid
 - Dry Monoglyceride
 - Hydrated Monoglyceride



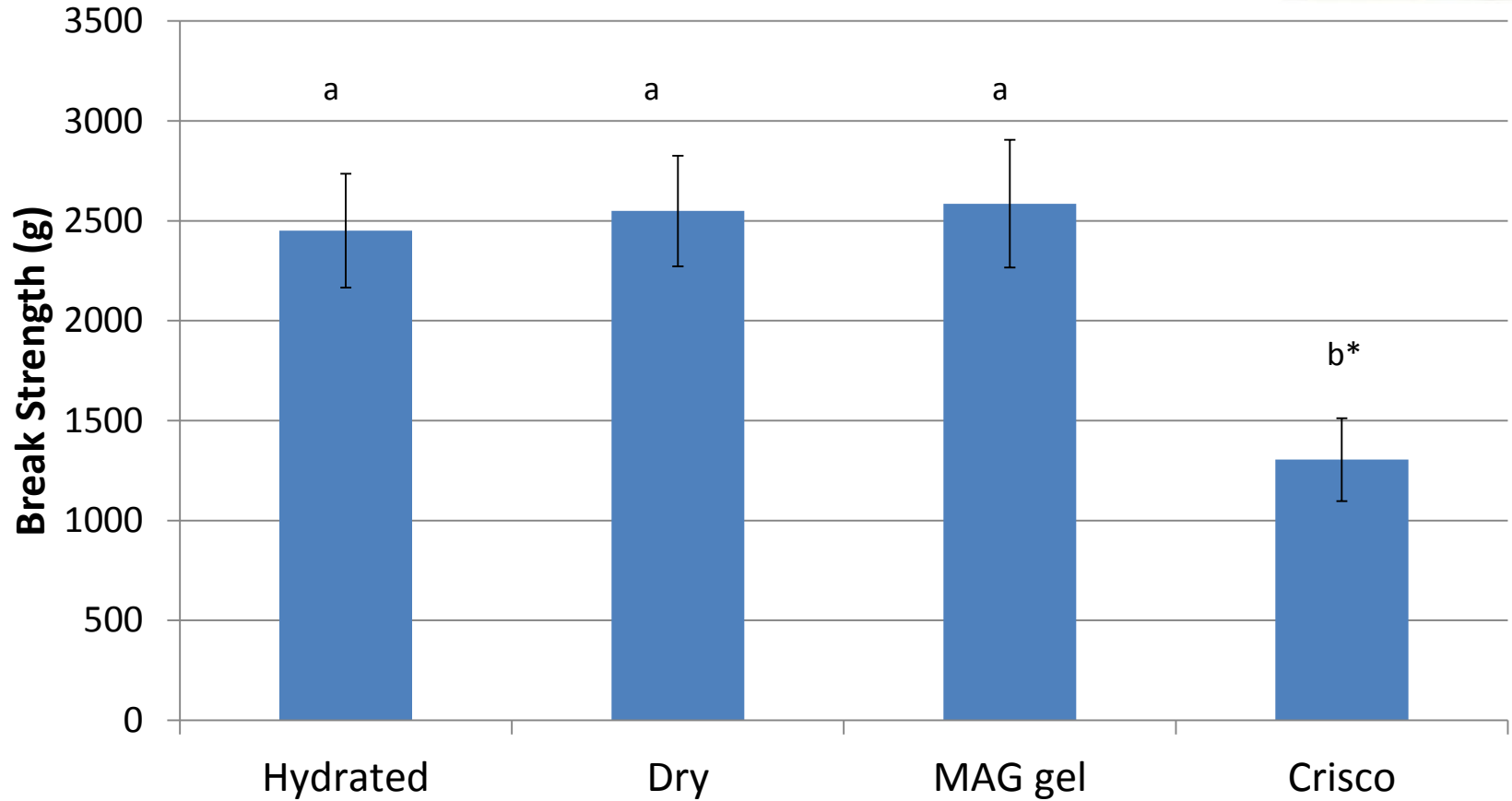
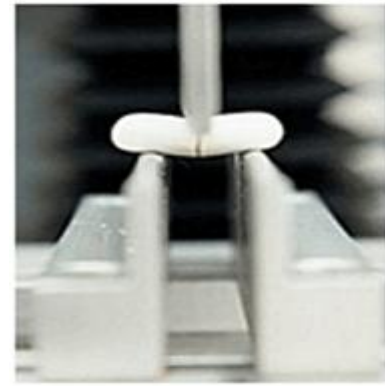
Formulation Changes

	Crisco	MAG gel	Dry MAG	Hydrated MAG
Dry Ingredients (g)				
Sucrose	94.5	94.5	94.5	94.5
Non-fat dry milk	2.3	2.3	2.3	2.3
NaCl	2.8	2.8	2.8	2.8
Sodium Bicarbonate	2.3	2.3	2.3	2.3
Ammonium Bicarbonate	1.1	1.1	1.1	1.1
Flour	222.4	222.4	222.4	222.4
Wet Ingredients (g)				
Deionized Water	48.52	10.75	10.75	10.75
High-fructose corn syrup	3.4	3.4	3.4	3.4
Shortening (g)				
Crisco Shortening	90			
MAG gel		90		
Dry MAG			4	
Hydrated MAG				7.79
Stearic Acid			0.2	0.2
Canola Oil			49.74	49.74
Deionized Water			36	34.05

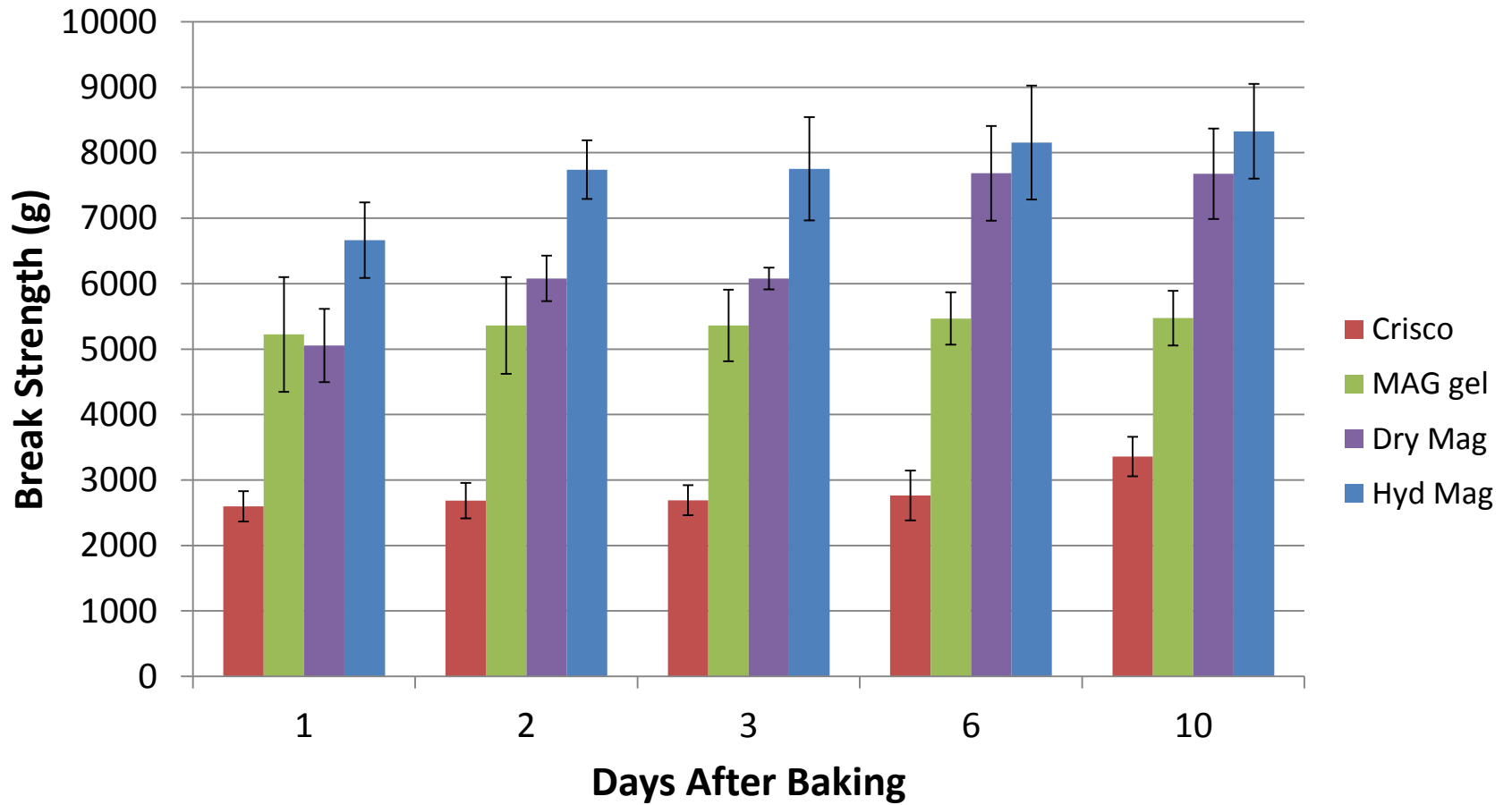
Dough Firmness



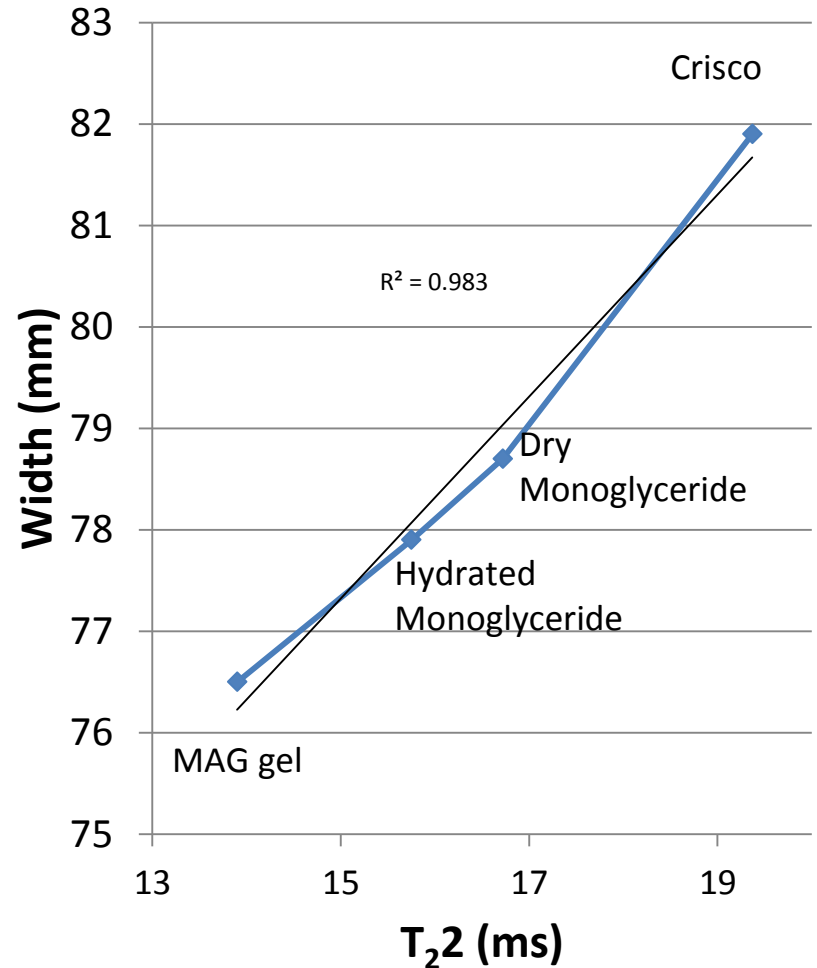
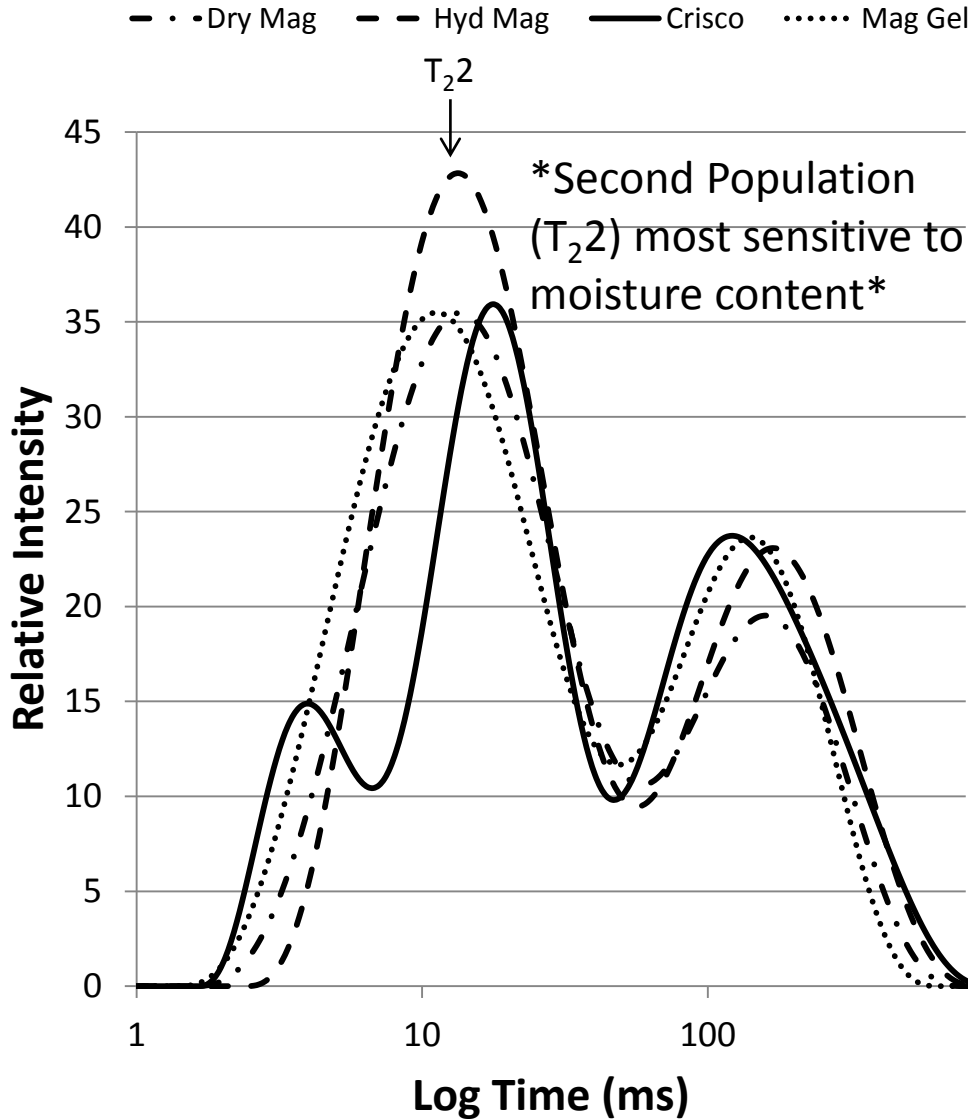
Break Strength



Shelf Life



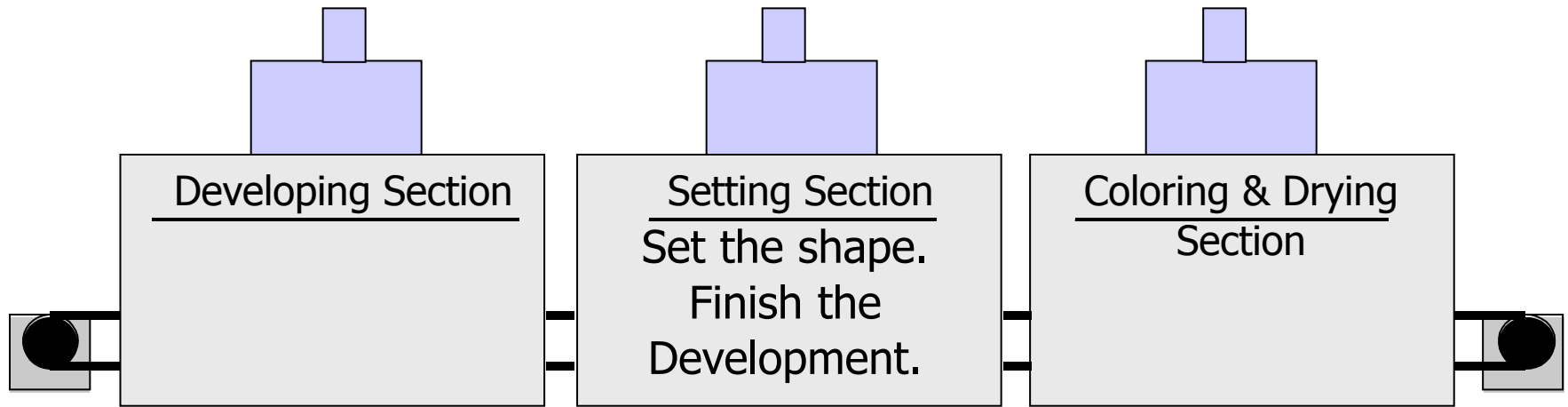
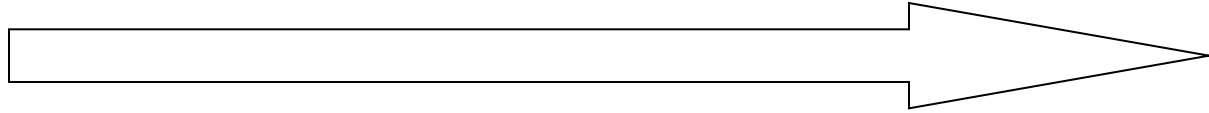
Water Mobility



Product Attributes

Sample	Width (mm)	Length (mm)	Height (mm)	Moisture content (%)	L*	A*	B*
Crisco	81.9a	84.7c	35a	4.22a	59.7a	8.6b	27.8a
MAG gel	76.5c	77.5a	44.3c	6.22c	62b	9.2b	29.2b
Hydrated	77.9b	79.5b	46d	8.65d	63.7c	7.62a	32.1d
Dry MAG	78.7b	79.9b	41.4b	5.52b	62.1b	8.4ab	31.3c

Process Variables



Time, temperature,
heat flux & humidity
control development.

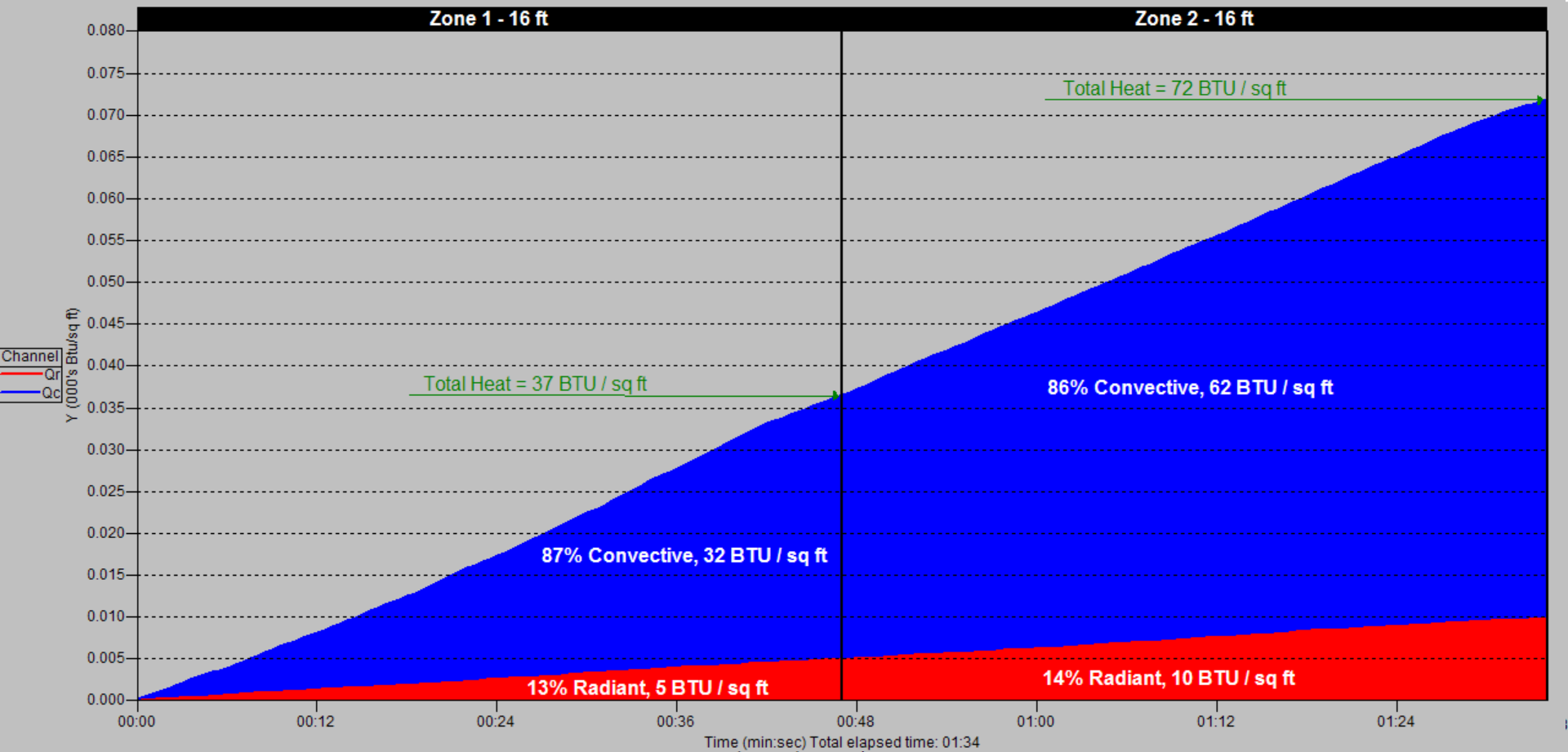
Add color by controlling
temperature & air flow.
Attain final moisture.

Cracker Oven Heat Flux

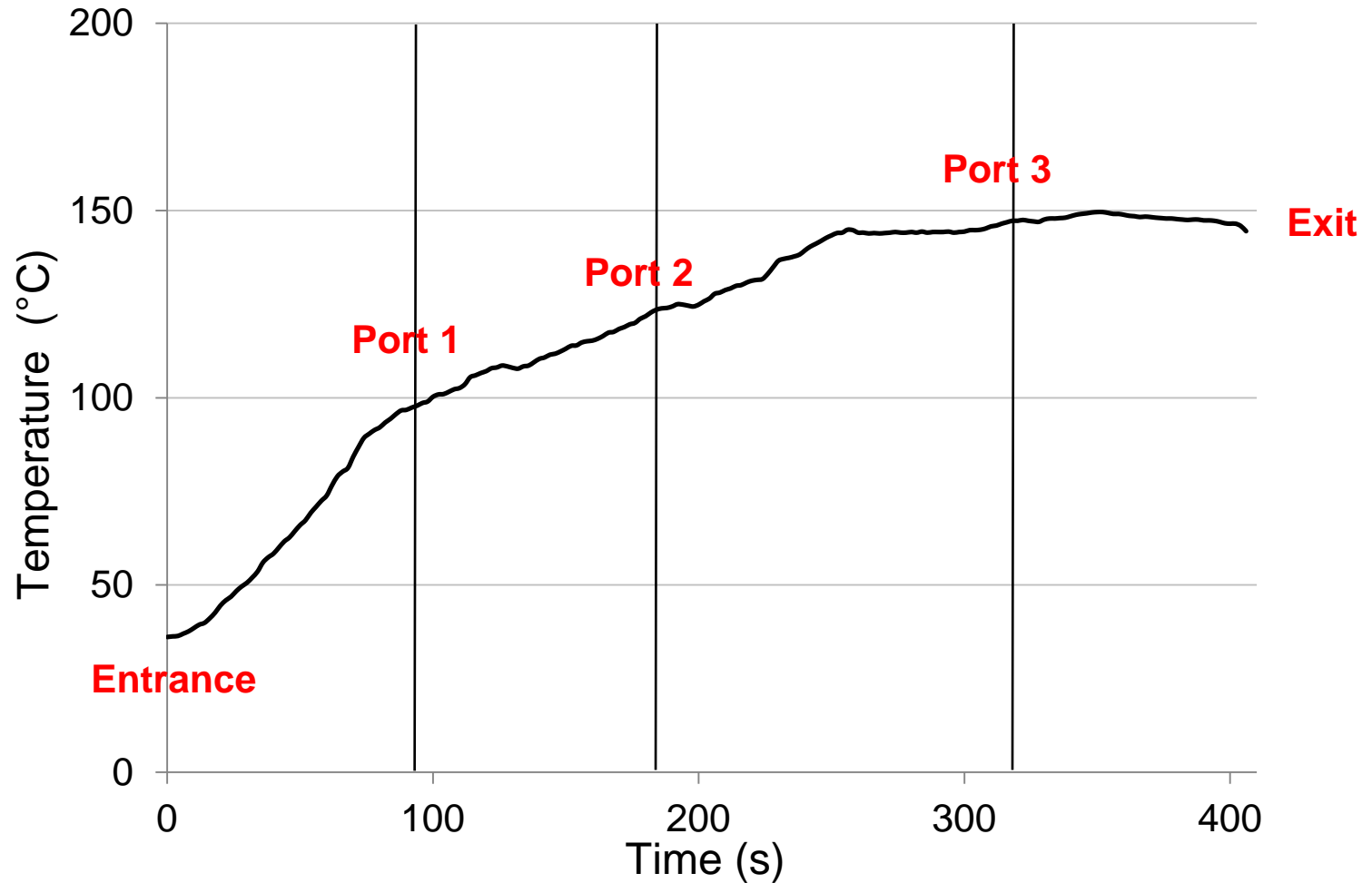
Date: July 27, 2006
Time: 11:01
User: RJS

Total Heat - Condition 1 - Convection Heating Only

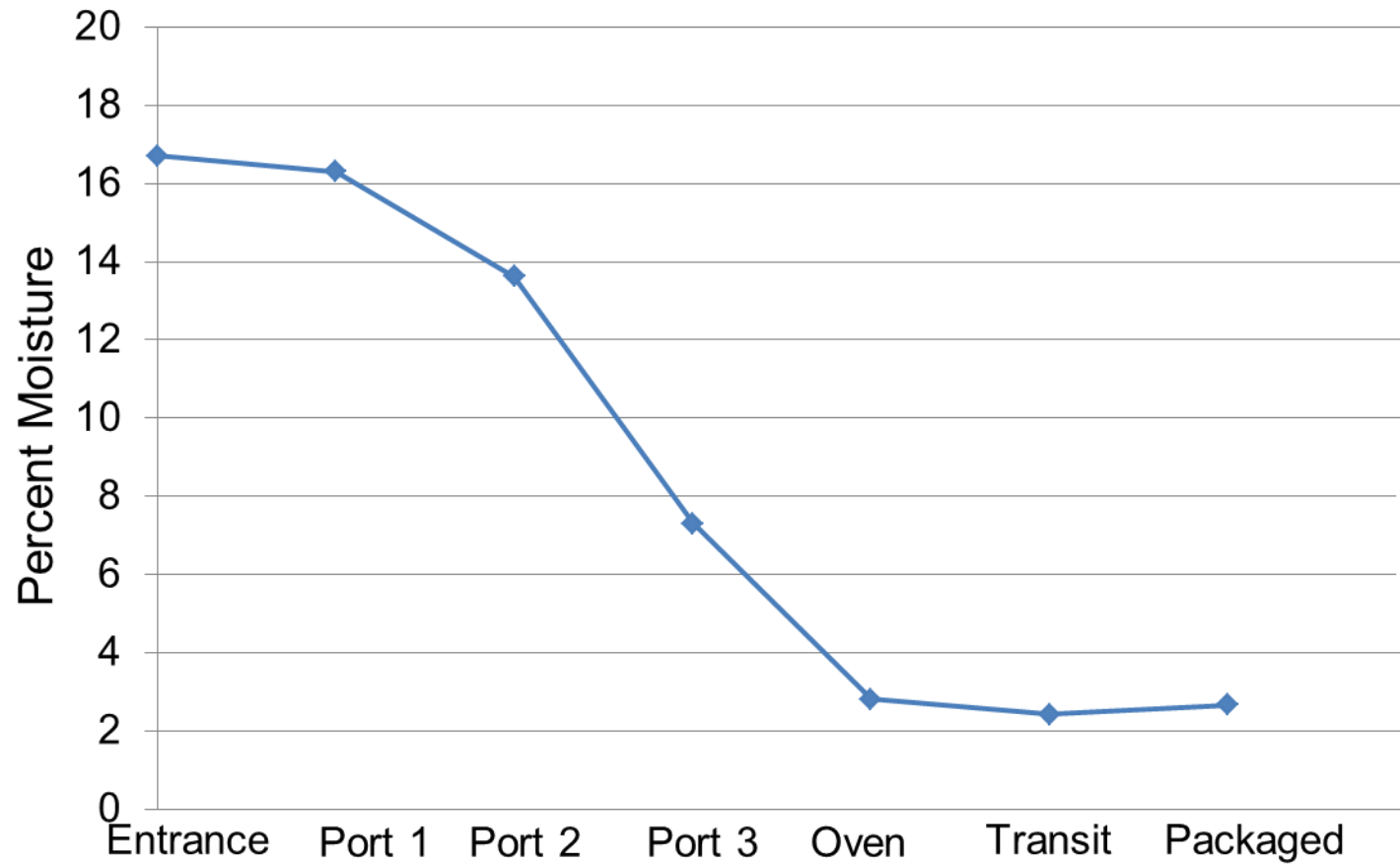
Process name: Tech Ctr Multi Grain Cracker
Product name: Multi Grain Cracker - 7 grain
File name: C:\ATCMG HF-01c.sv7



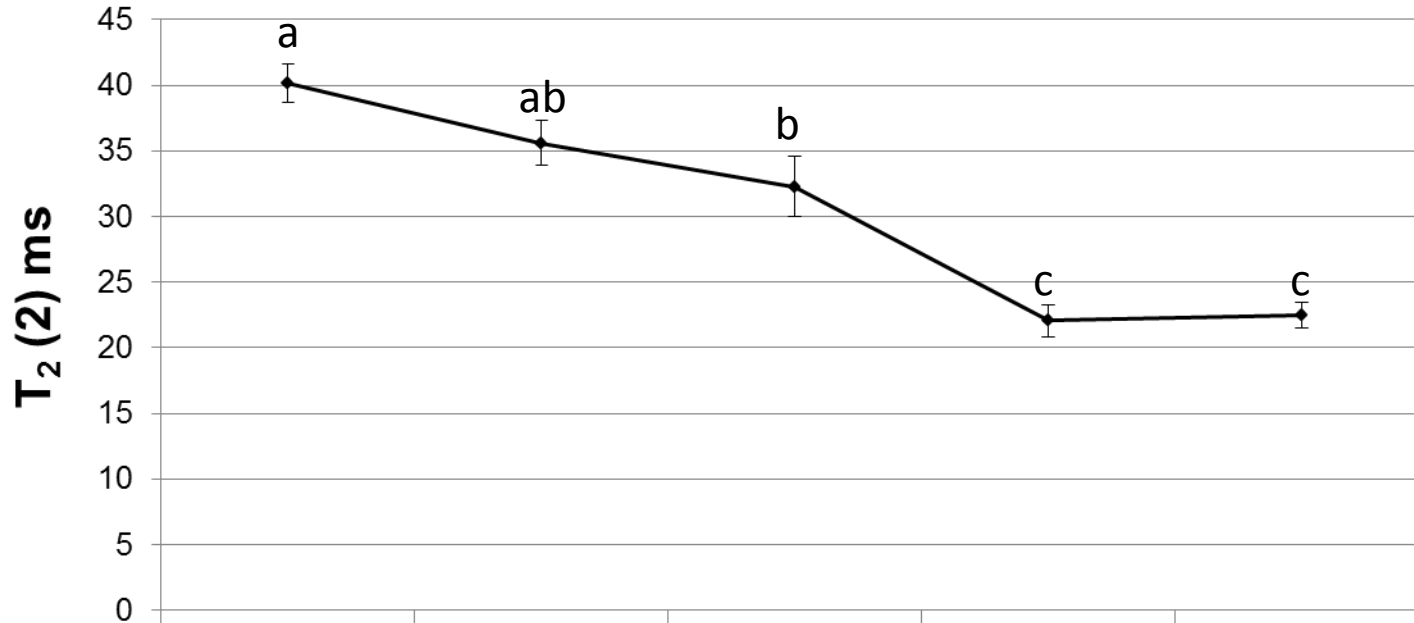
Internal Product Temperature



Moisture Content

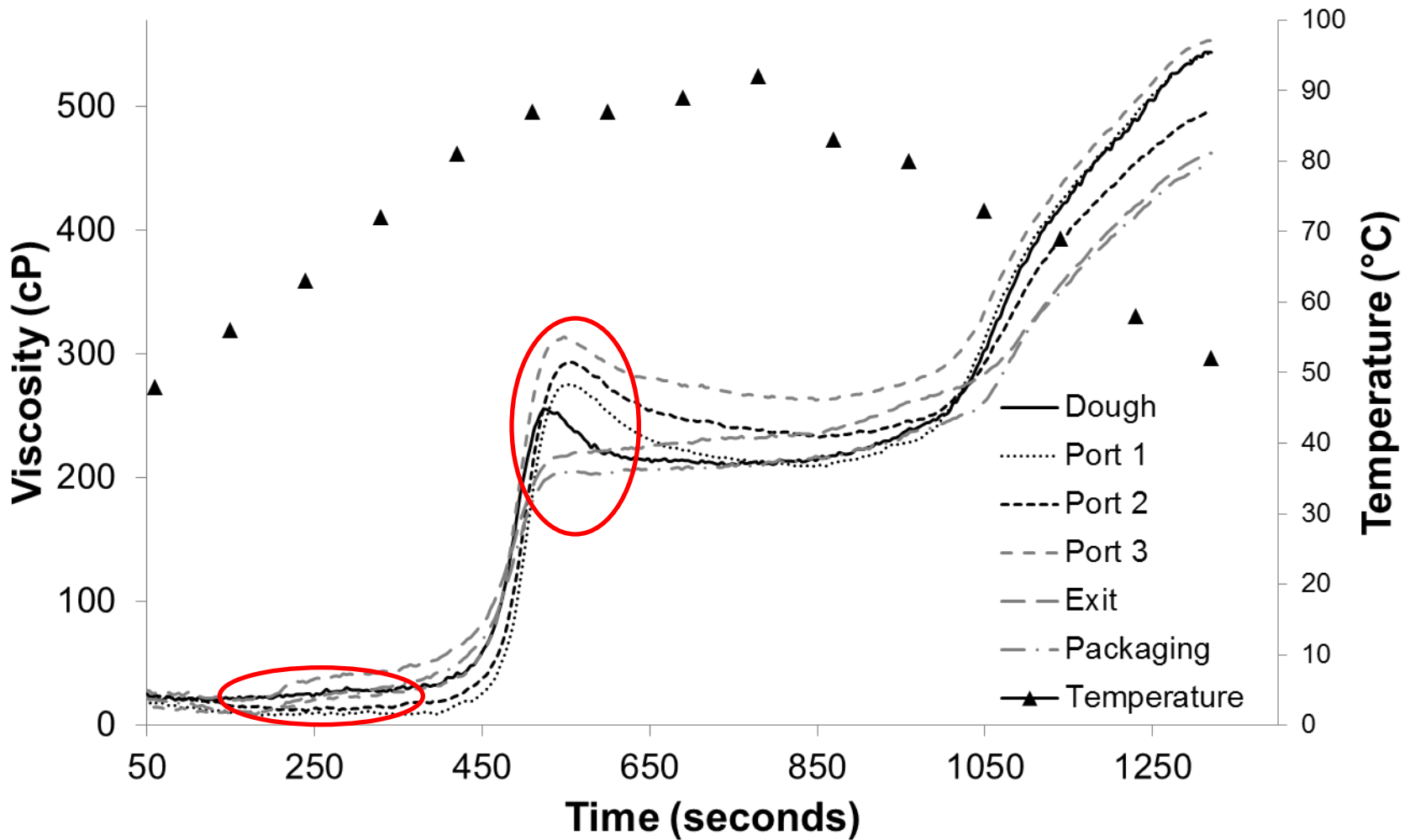


Water Mobility

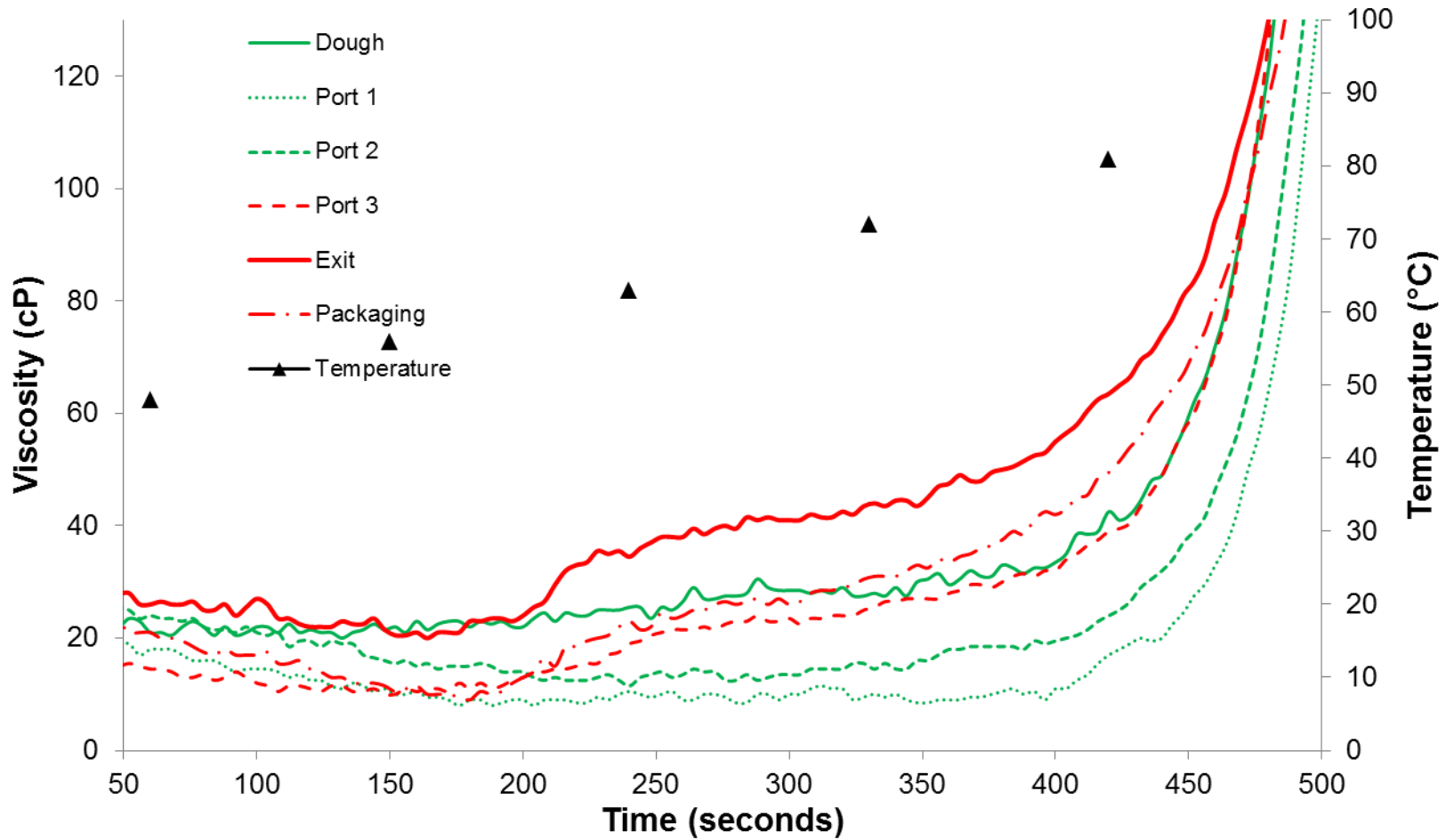


Location	Entrance	Port 1	Port 2	Port 3	Exit
Time (s)	0	86	180	316	400
Temp. (°C)	36	97	122	147	146
Moisture (%)	16.4	15.9	14.0	8.4	3.6

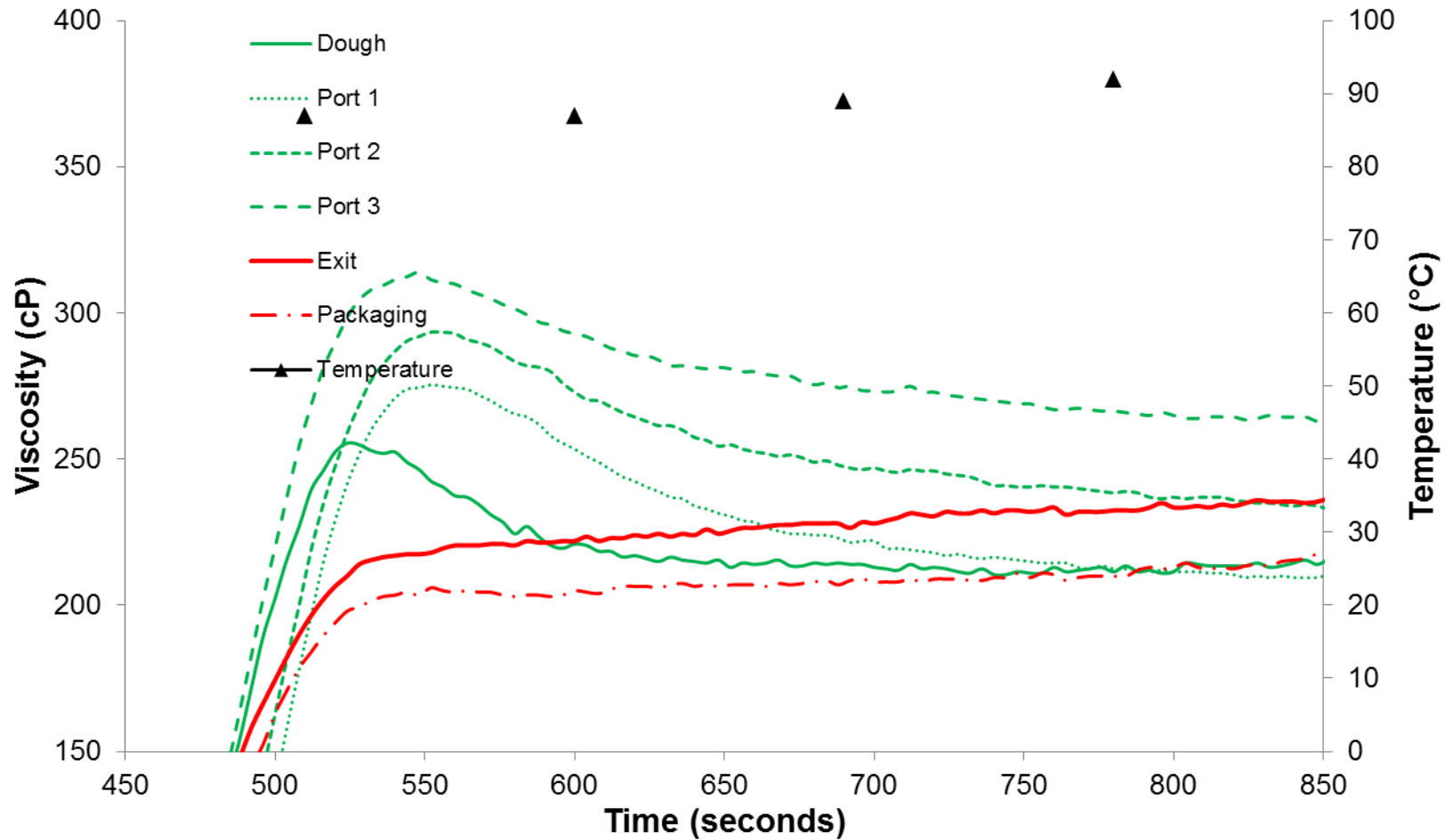
Viscosity



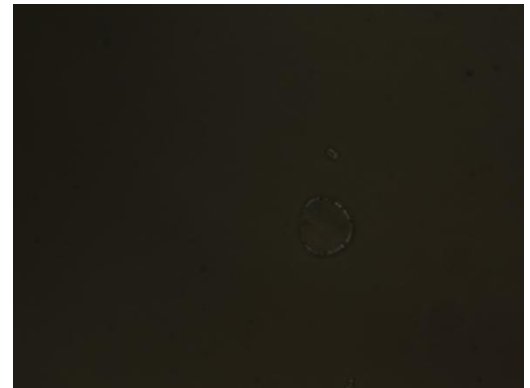
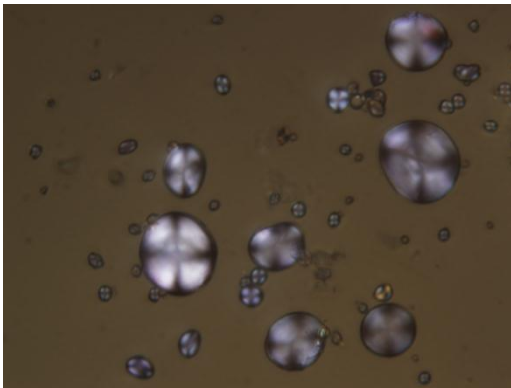
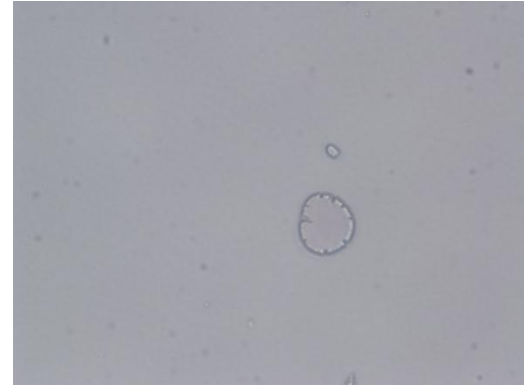
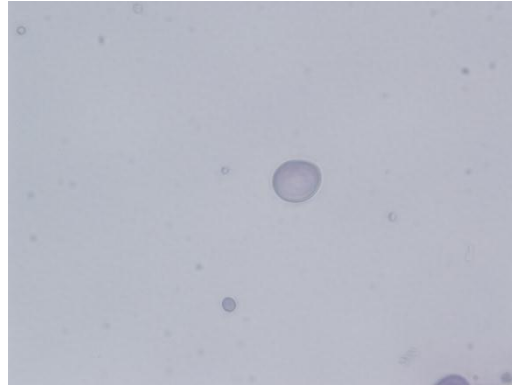
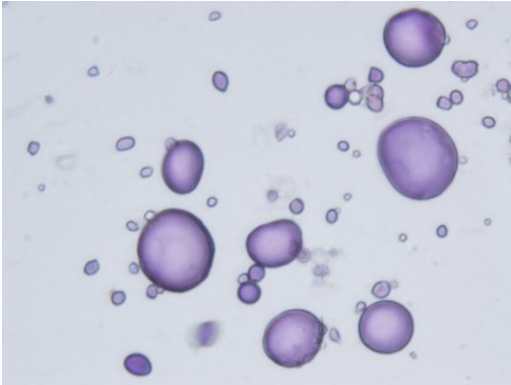
Viscosity



Viscosity



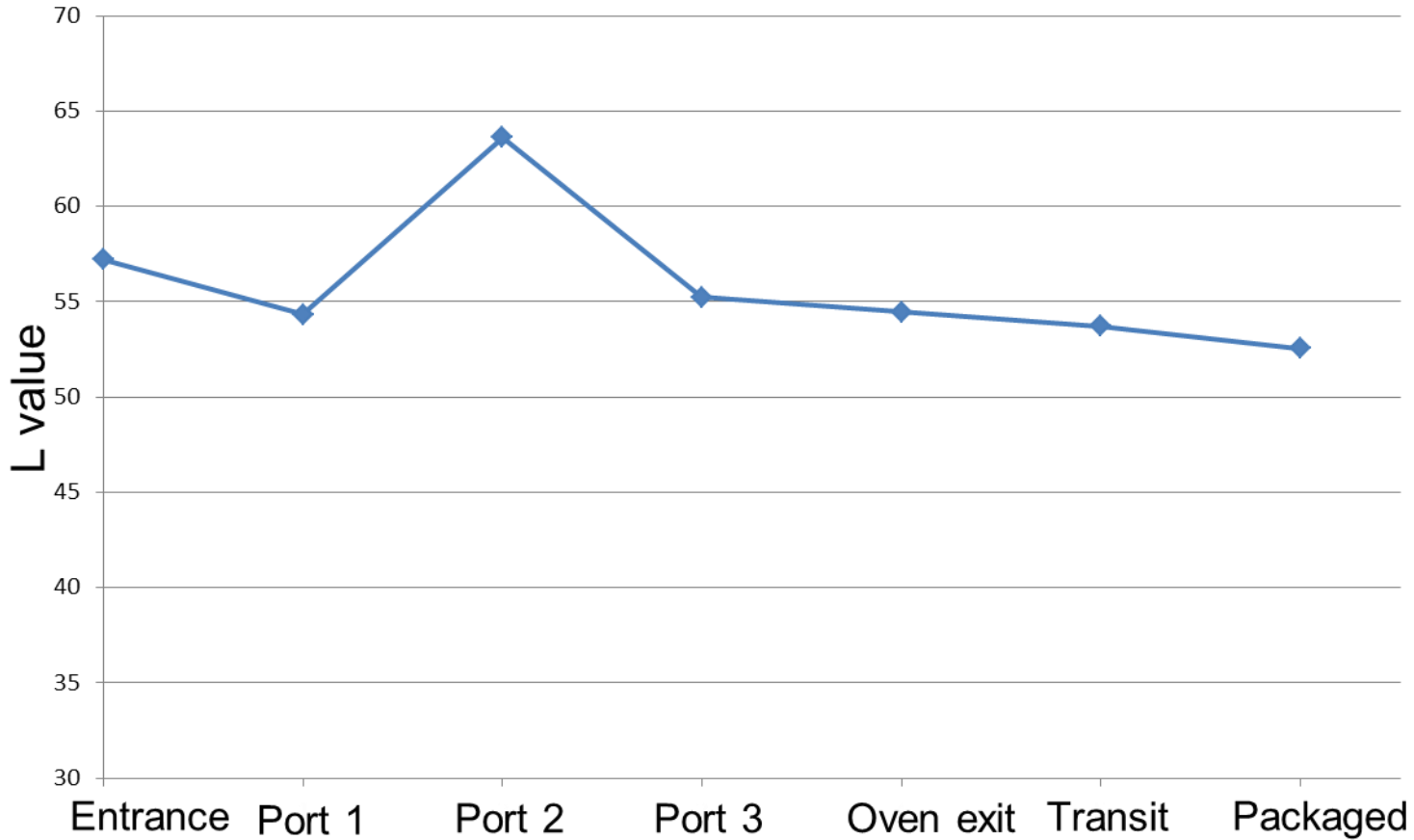
Starch Microscopy



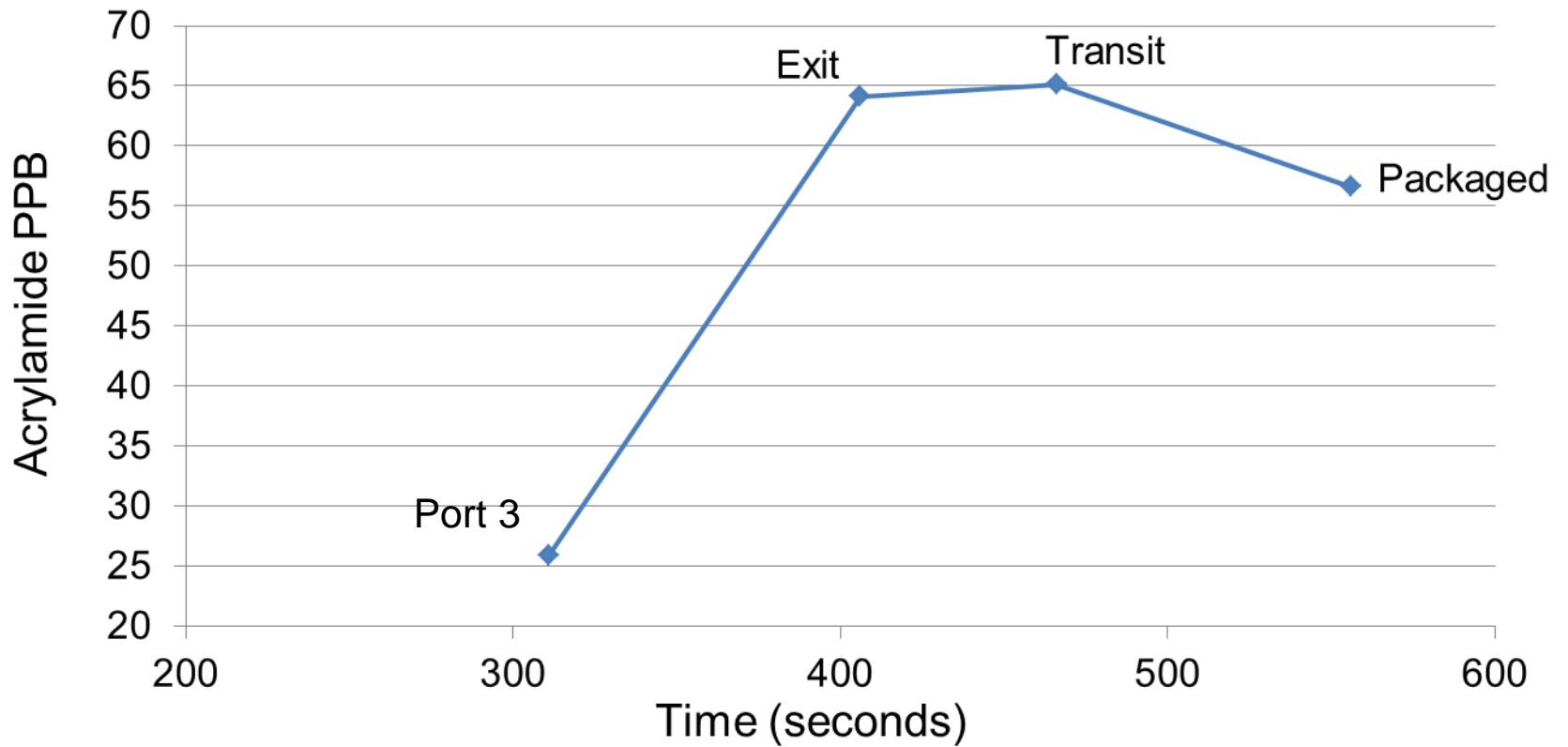
Dough

Baked Cookies

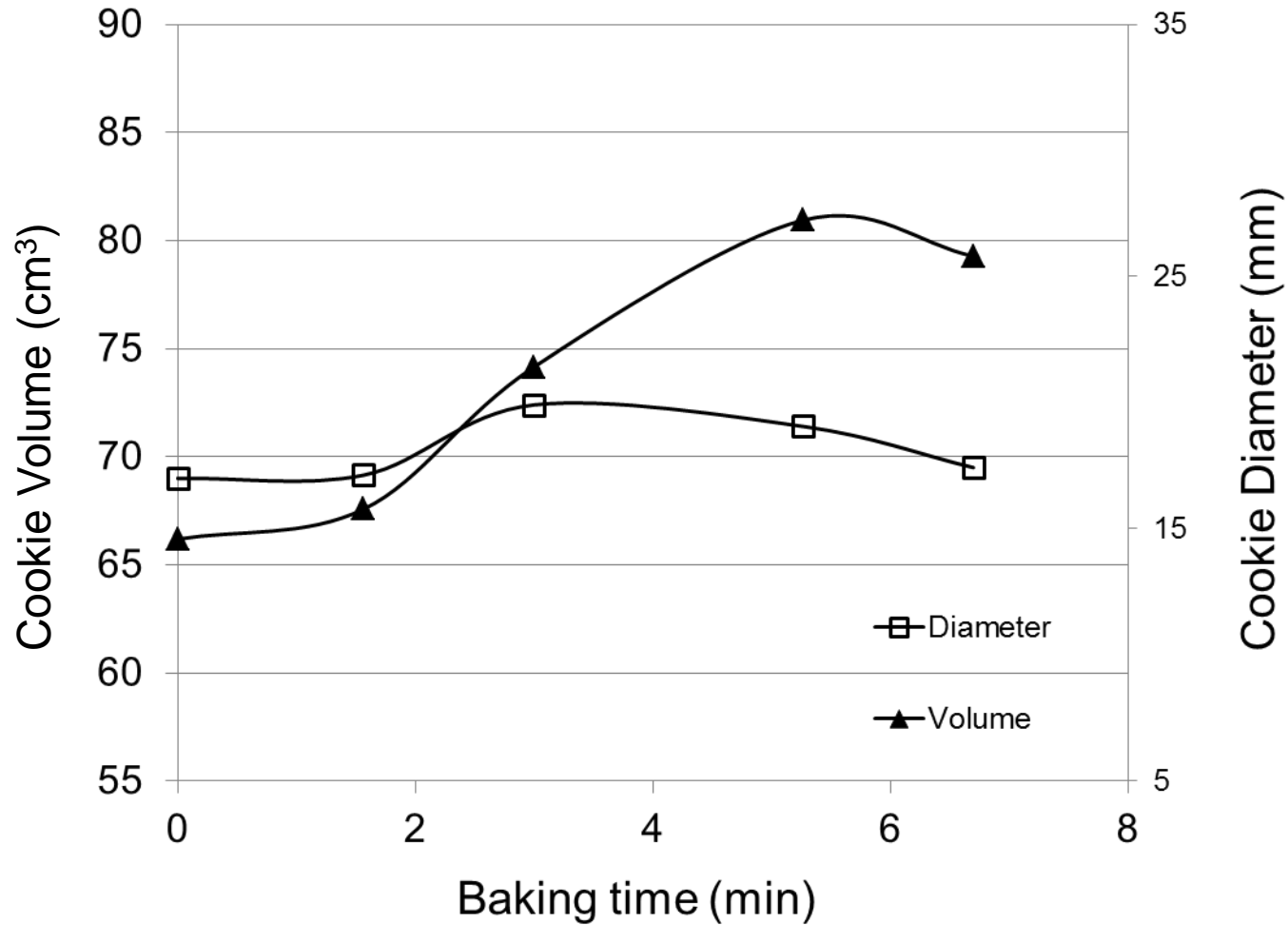
Colour Development



Acrylamide



Cookie Volume and Diameter



Conclusions

- Product characterization in process helps explain the product
- Consider Ingredient Interactions
- Should allow better targeted interventions