



The Use of Emulsifiers to Give Healthy, Highly Functional Bakery Fats

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Healthy, Highly Functional Bakery Fats

- **Introduction**
 - Bakery
 - The role of fats
- **Rising of Bread and Cakes**
- **Bakery Shortenings**
- **Structuring**
- **Conclusions**
- **Future Needs**

Bakery – Oils & Fats

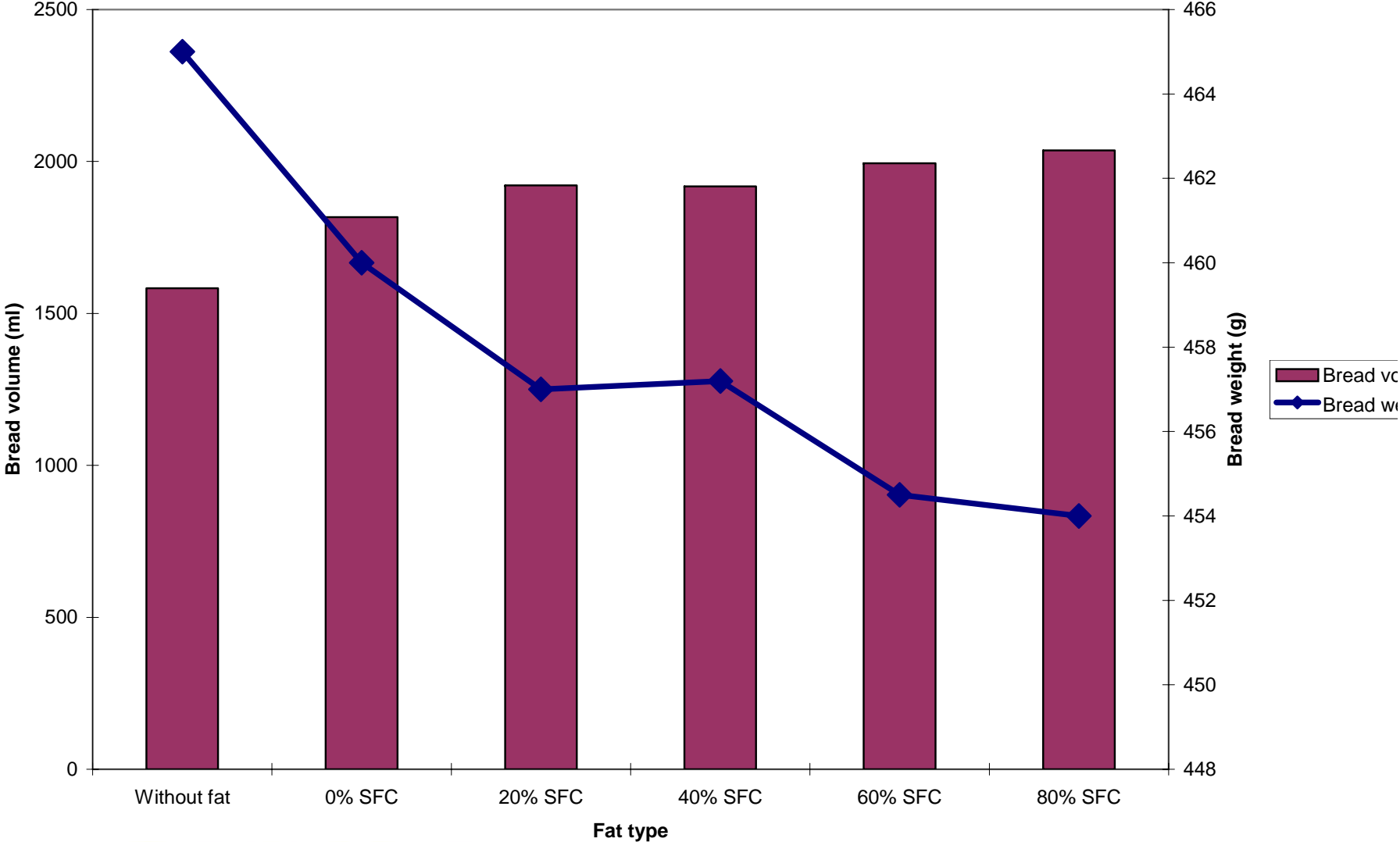
- **Many Different Products**
- **Virtually all include fats**
- **Bread 0-5% Hamburger bread is higher**
- **Cakes Up to 50%**
- **Pastry Up to 50%**

- **Biscuits, doughnuts etc.**

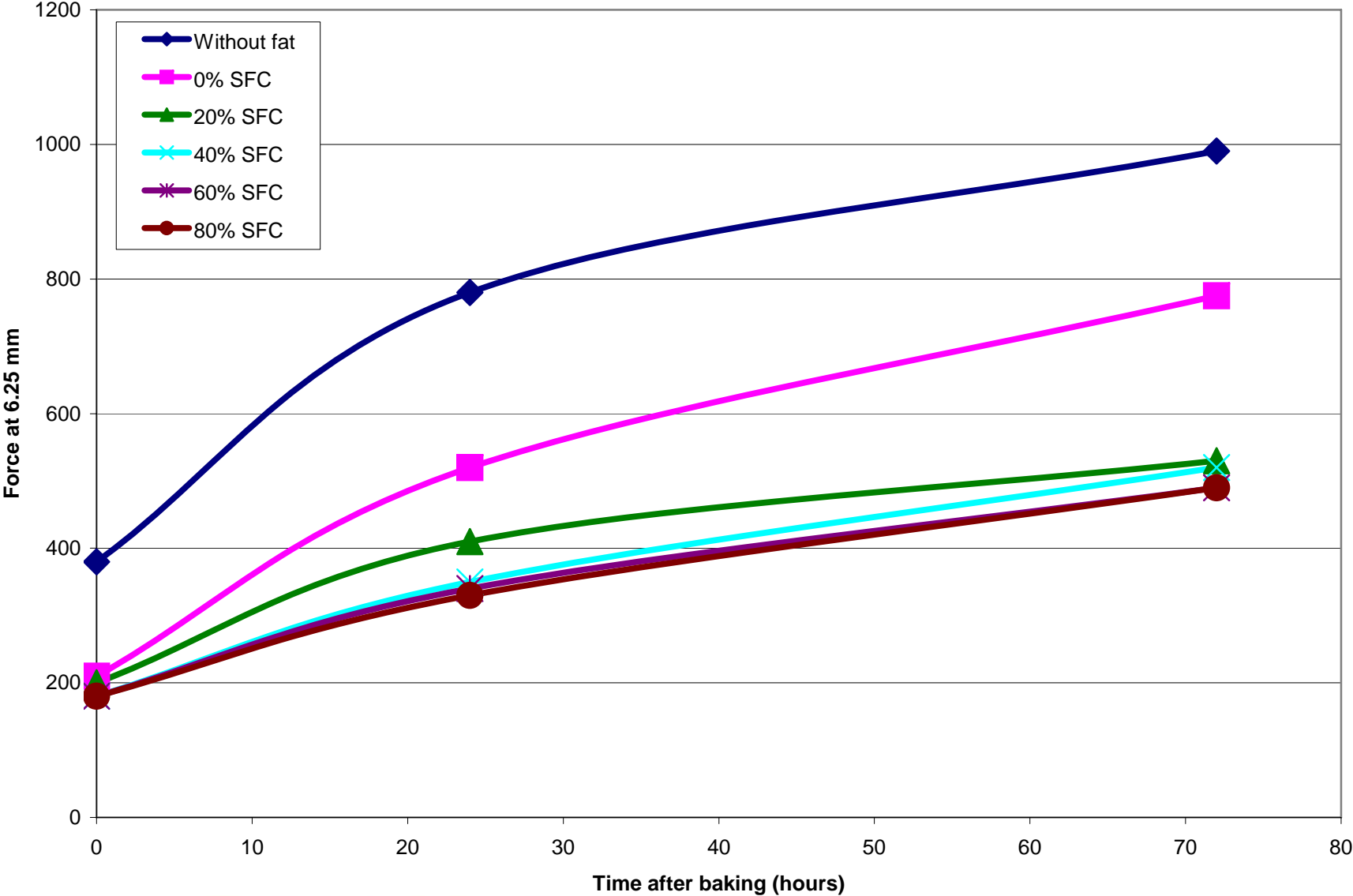
What do fats do in a product?

- **Mouthfeel**
- **Shortening (texturising)**
- **Foaming**
- **Staling**

Effect of solid fat on bread Rising



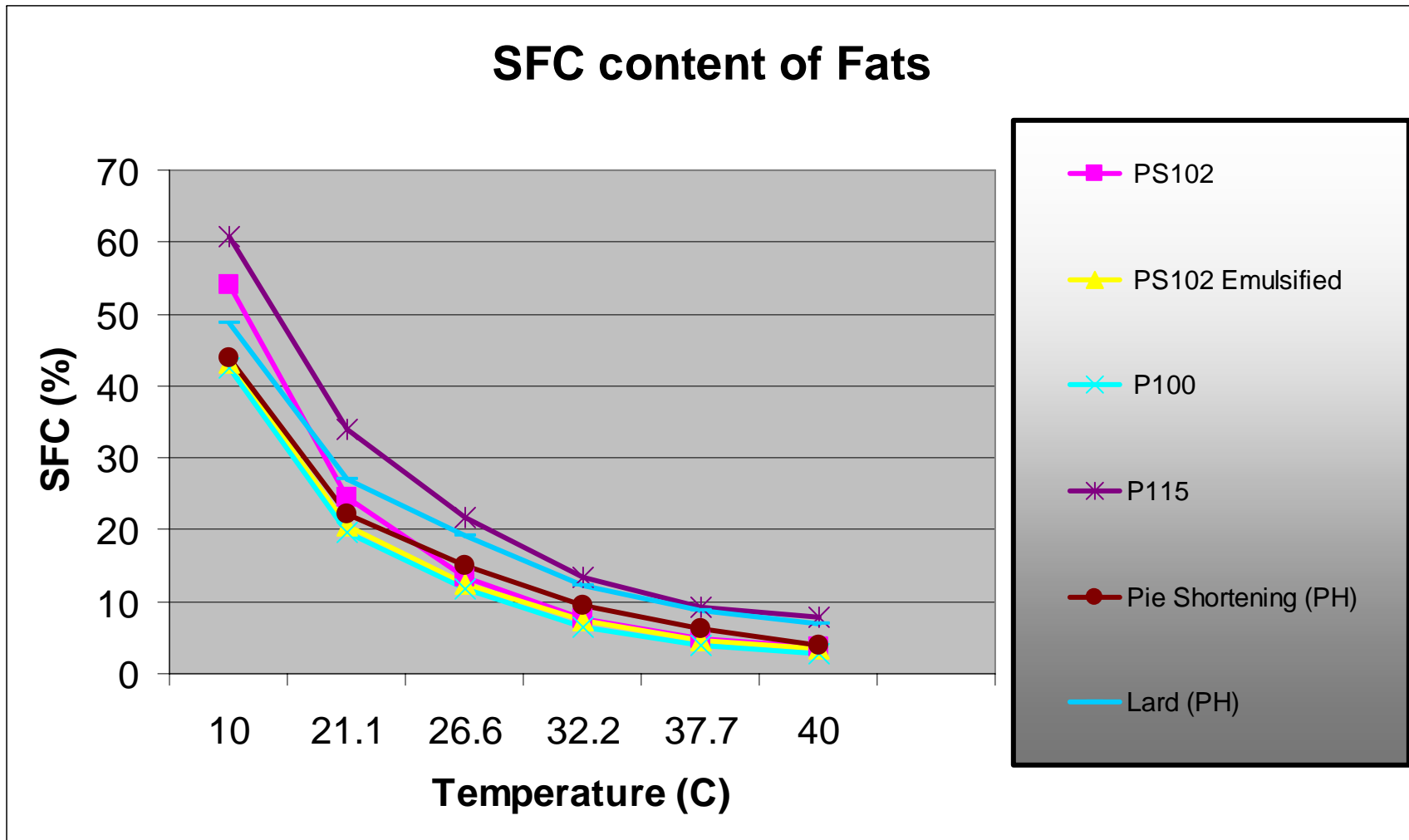
Effect of Solid fat on Bread Staling



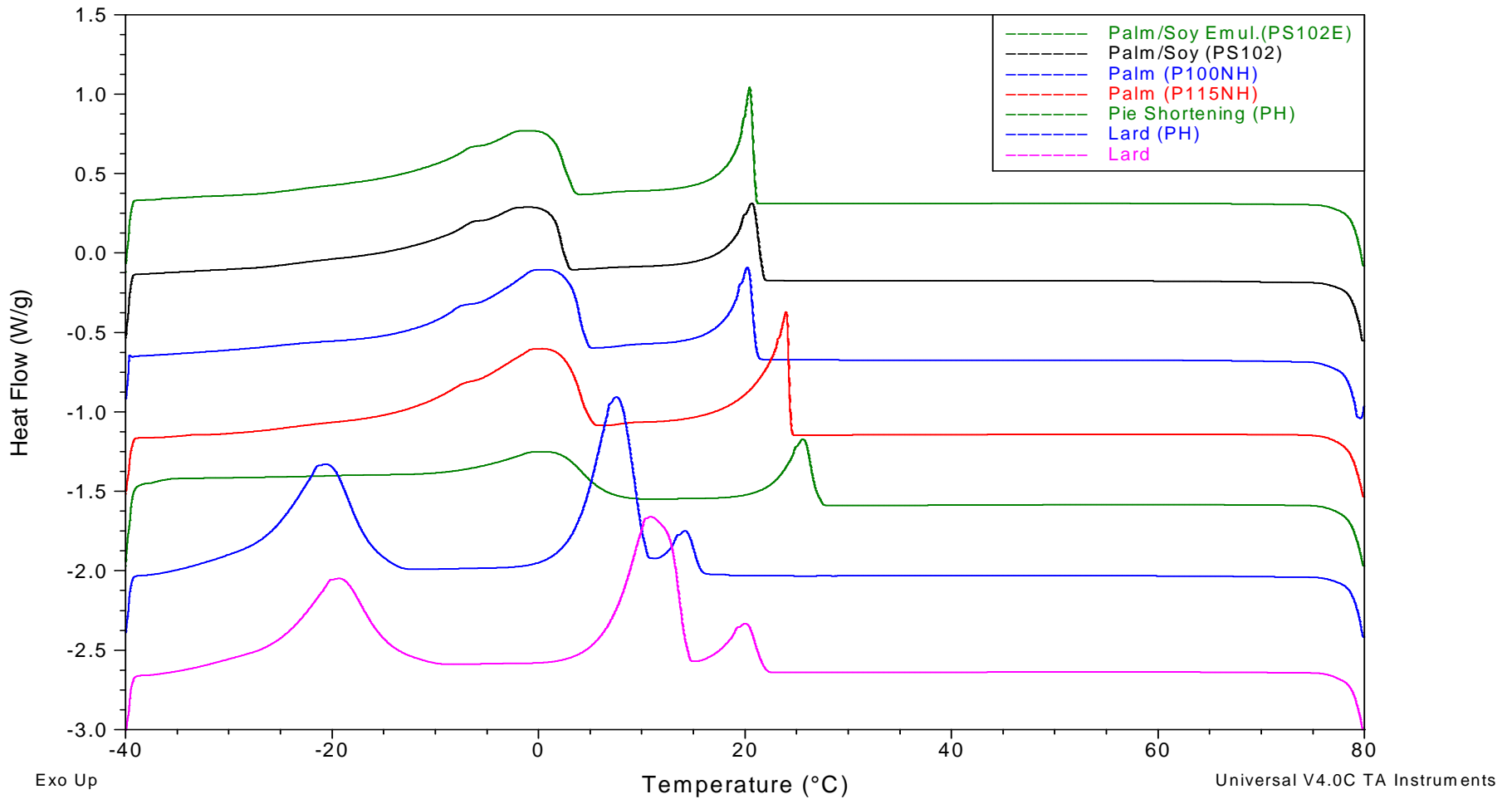
Bakery Shortening Functionality

- **All structural parameters are important in predicting final functionality.**
- **Crystallization and melting behavior alone may not**
 - indicate changes in polymorphism
 - Impart the direct information on SFC
 - Give any information on microstructure
- **Relying on SFC alone to predict hardness has been shown to be unreliable (Narine and Marongoni, 1999).**

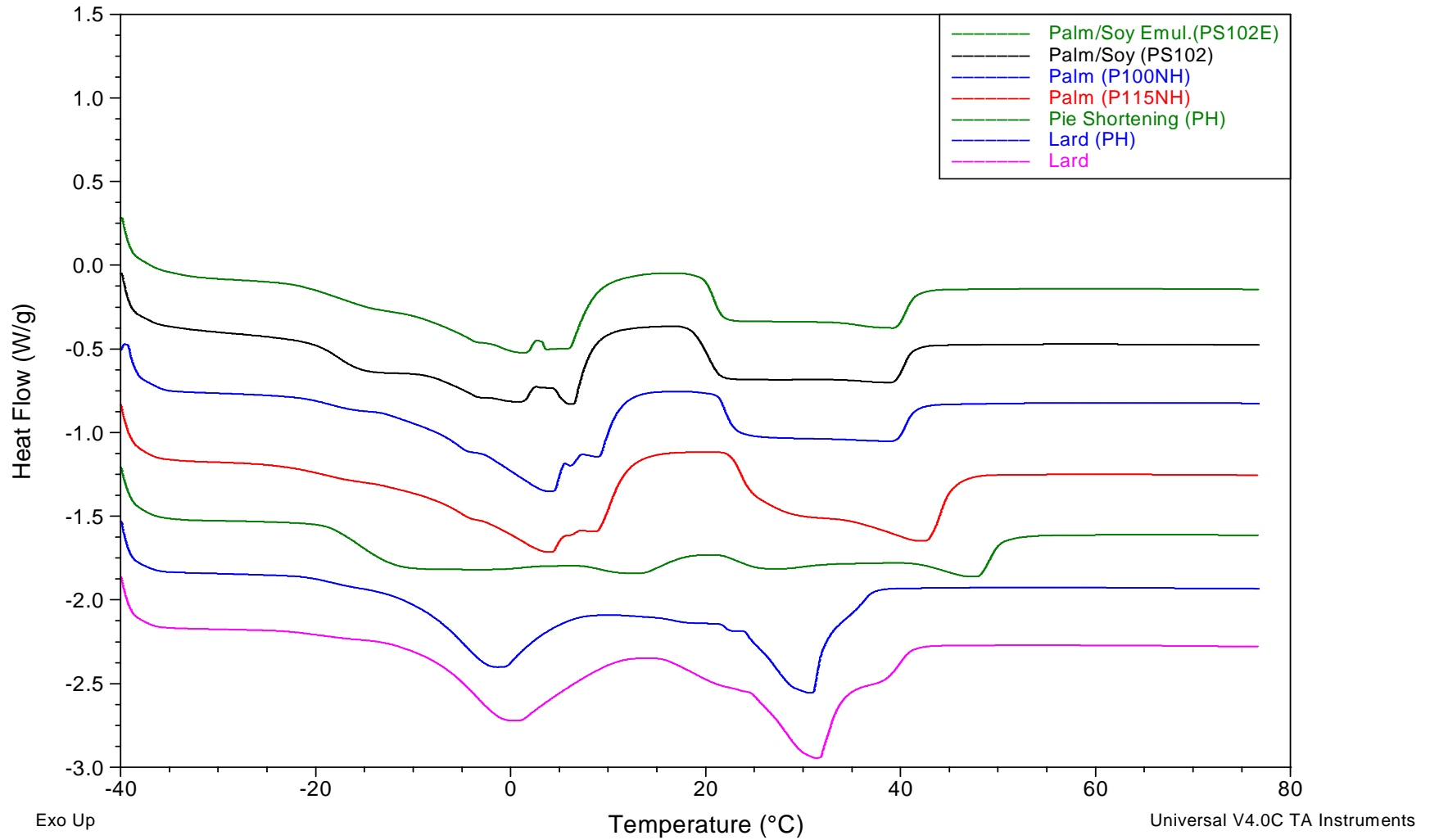
Pie Crust Shortenings



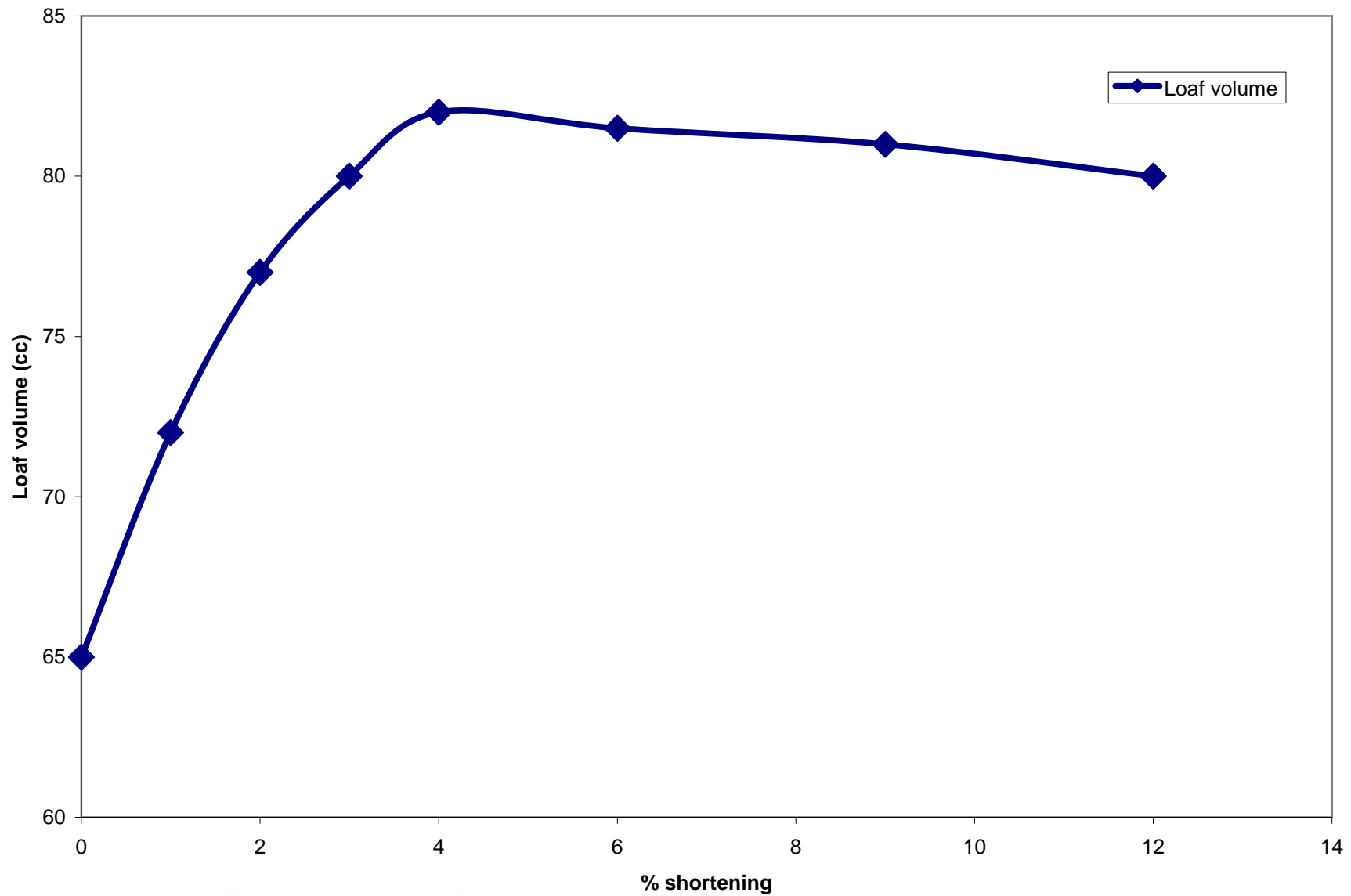
Crystallization Curves of Pie Crust Shortenings



Melting Curves of Pie Crust Shortenings



Effect of Fat Content on Volume



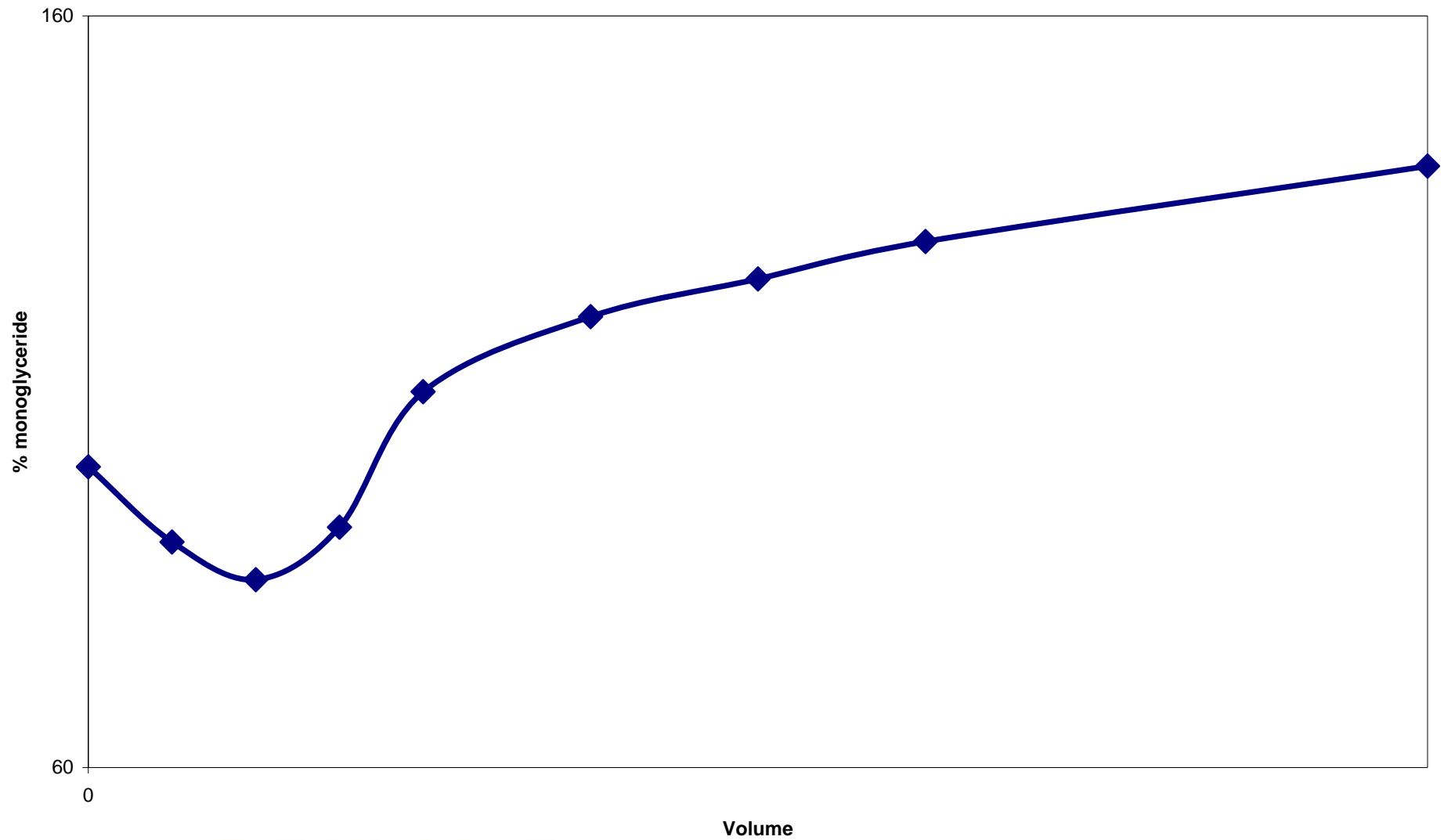
Effect of Surfactants on Volume

Surfactants	Volume (cm³)	Deviation (cm³)
None	760	...
SSL	862	17.7
Polysorbate	775	28.3
Ethoxy		
monoglyceride	813	24.7
DATM	853	20.2
Monoglycerides	763	15.3
Succinated		
monoglycerides	838	5.8
Lecithin	837	15.3

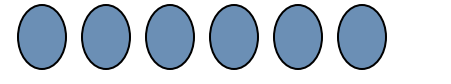
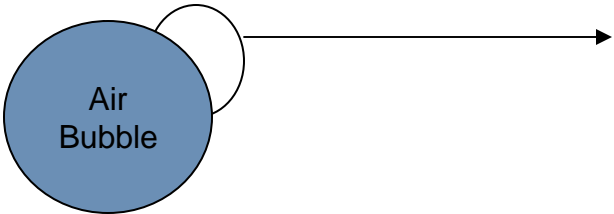
C. S. LAI A. B. DAVIS, and R. C. HOSENEY

Cereal Chem. 66(3):224-227

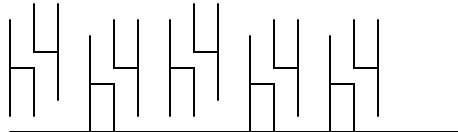
Effect of Surfactant Concentration



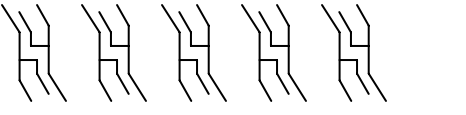
Mechanisms



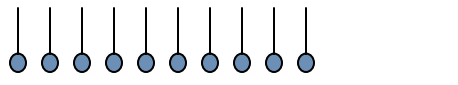
No fat
Proteins at Surface



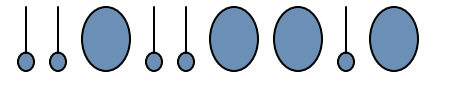
Saturated Fats
Saturated Fat at Surface



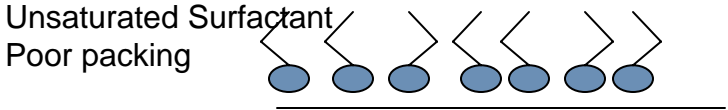
Unsaturated Fats
Poorer Packing



Saturated Surfactant
Good Packing



Low Surfactant
Poor Surface



Fat Crystals

- **Solid Components are also important**
- **Crystals give structure, flavour, texture**
- **Poor crystallisation leads to problems,**
 - Untempered bloomed chocolate or grainy butter.
- **Crystals provide strength and structure**
- **Structure mainly from unhealthy saturated or trans fats**

Healthy Oils

- **High Omega-3 Content**
 - Fish
- **Polyunsaturates**
- **Monounsaturates**

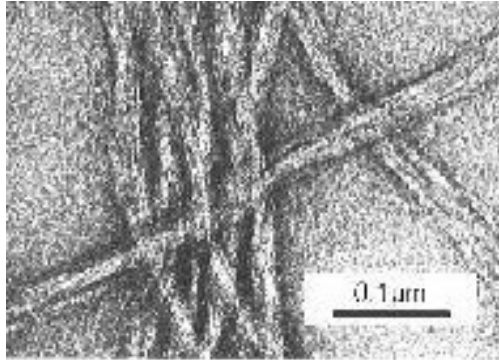
- **Liquid Oils.**

- **Hard to Structure.**

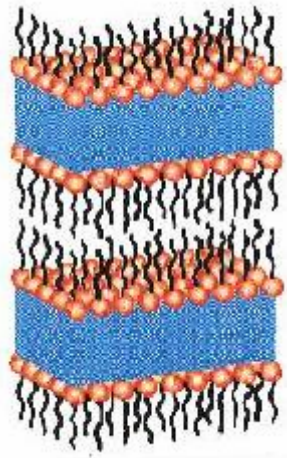
Application of Structures

- **Non-Glyceride Materials: Starches etc**
 - Low fat, Low calorie solutions are possible, but poor mouthfeel and texture
- **Non-triglyceride lipids**
 - Waxes etc (health implications)
- **Surfactant Structuring**
- **Optimisation of Crystal Structure**
 - Crystal Habit Modification

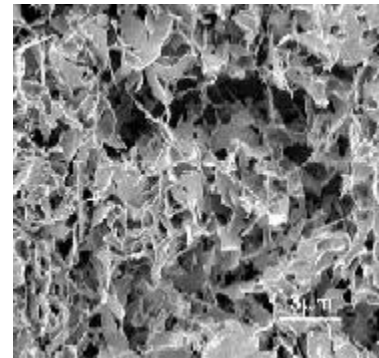
Surfactant Structures



Stranded Structure of a Polysaccharide Gel

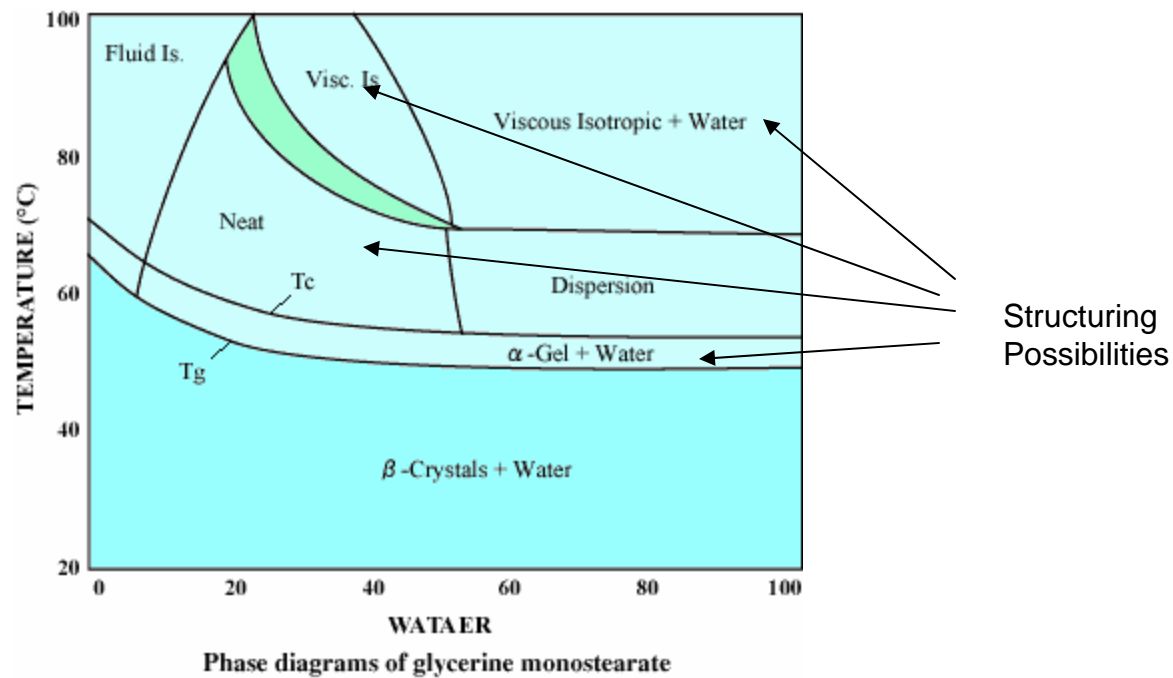


Lamellar structure of an alpha monoglyceride gel



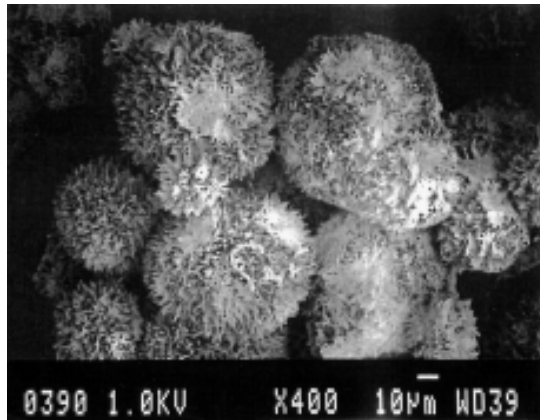
Monoglyceride crystals
In a coagel

Monoglyceride Phase Diagrams



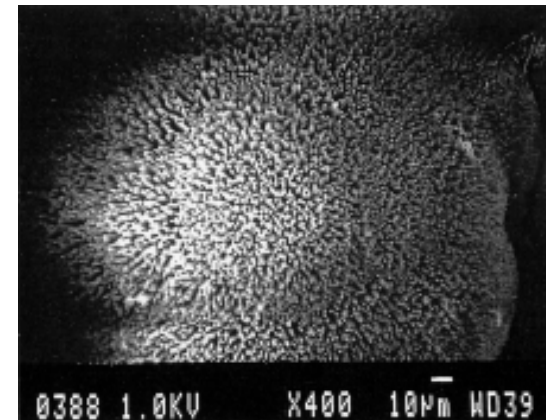
Control of Composition and Processing gives different phases with different structuring abilities.

Crystal Habit Modification



Palm Oil

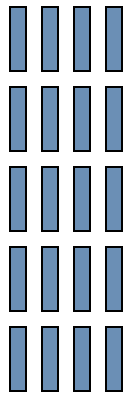
Add 0.5% Phosphatidyl ethanolamine



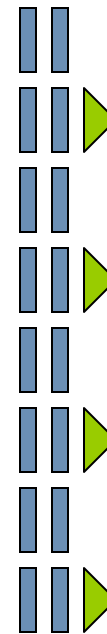
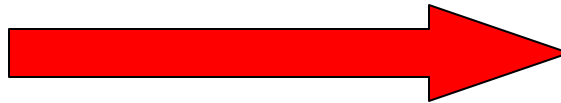
Palm Oil + Habit Modifier

Specific Crystal Habit Modifiers

Crystal shape and size affects structure
Alter the shape and size to give more efficient structuring
Poison growth in certain directions to get better shaped crystals



Add Crystal Habit Modifier



Green additives bind
Into structure & prevent
Further growth
Leading to habit
Modification.

Conclusions

- **Fats play an important role in baked products**
- **Effects occur on Dough Interactions and Structuring**
- **Different techniques are possible to replace unhealthy triglycerides**
- **Tactics required depend on product performance**
 - Mouthfeel, Appearance etc
- **Controlled addition of emulsifier can give optimised structures**

The Future

- **Increasing Segmentation allowing for different solutions**
 - Lower calorie
 - Luxury
- **Innovative application of emulsifiers to create structures**
- **Organogels**

Thank you for your attention

Any Questions?