

Transparency and Meltability in Hot-Process Soap

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\$Revision: 1.4 \$

Previous Work

- *Modern Soap Making*, Thommsen and Kemp, 1937
- *Making Transparent Soap*, Failor, 1997, 2000
- *How to Make Melt & Pour Soap Base from Scratch*, Fioravanti, 2011

Acknowledgements

- Mike Lawson/Columbus Foods
- Hampden-Sydney College
 - John Gammon
 - Kent Saxton
 - Brandon Crosby

All Natural Transparent Melt&Pour Soap

All Natural Transparent Melt&Pour Soap

- It's natural!

All Natural Transparent Melt&Pour Soap

- It's natural!
- It melts and pours!

All Natural Transparent Melt&Pour Soap

- It's natural!
- It melts and pours!
- It's transparent!

What is So Great About Natural?

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Some completely natural chemicals:

- Cocaine (Coca)

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- Cocaine (Coca)
- Ricin (Castor Beans)

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- Cocaine (Coca)
- Ricin (Castor Beans)
- Morphine (Poppy)

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- Nicotine (Tobacco)

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- Ricin (Castor Beans)
- Morphine (Poppy)
- Nicotine (Tobacco)
- Mescaline (Peyote)

What is So Great About Natural?

Some completely natural chemicals:

- Cocaine (Coca)
- Ricin (Castor Beans)
- Morphine (Poppy)
- Nicotine (Tobacco)
- Mescaline (Peyote)
- Strychnine (Strychnos Nux Vomica)

What is So Great About Natural?

Some completely natural chemicals:

- Cocaine (Coca)
- Ricin (Castor Beans)
- Morphine (Poppy)
- Nicotine (Tobacco)
- Mescaline (Peyote)
- Strychnine (Strychnos Nux Vomica)
- Histamine (Immune System)

Ok, So How About Chemical-Free Transparent Melt&Pour Soap

Chemicals?

Ok, So How About Chemical-Free Transparent Melt&Pour Soap

All Chemicals:

- Air

Ok, So How About Chemical-Free Transparent Melt&Pour Soap

All Chemicals:

- Air
- Water

Ok, So How About Chemical-Free Transparent Melt&Pour Soap

All Chemicals:

- Air
- Water
- Soap

Ok, So How About Chemical-Free Transparent Melt&Pour Soap

All Chemicals:

- Air
- Water
- Soap
- Pretty much everything

Petrochemical-Free Transparent Melt&Pour Soap?

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This would allow:

- Sodium laureth sulfate (palm and coconut oil)

Petrochemical-Free Transparent Melt&Pour Soap?

This would allow:

- Sodium laureth sulfate (palm and coconut oil)

And forbid:

- Cocamidapropyl betaine (palm and coconut oil, natural gas)
- Propylene glycol (natural gas)
- Triethanolamine (natural gas)

Customized Transparent Melt&Pour Soap

Completely free of:

- Whatever your customer wants it to be free of

Customized Transparent Melt&Pour Soap

Completely free of:

- Whatever your customer wants it to be free of
- For whatever reason

Customized Transparent Melt&Pour Soap

Completely free of:

- Whatever your customer wants it to be free of
- For whatever reason
- Whether or not you share that preference

Customized Transparent Melt&Pour Soap

- *It's customized!*
- It melts and pours!
- It's transparent!

Cold-Process Soap

What happens when you microwave cold-process soap?

Cold-Process Soap

What happens when you microwave cold-process soap?

- Frothing

Cold-Process Soap

What happens when you microwave cold-process soap?

- Frothing
- Steaming

Cold-Process Soap

What happens when you microwave cold-process soap?

- Frothing
- Steaming
- No melting

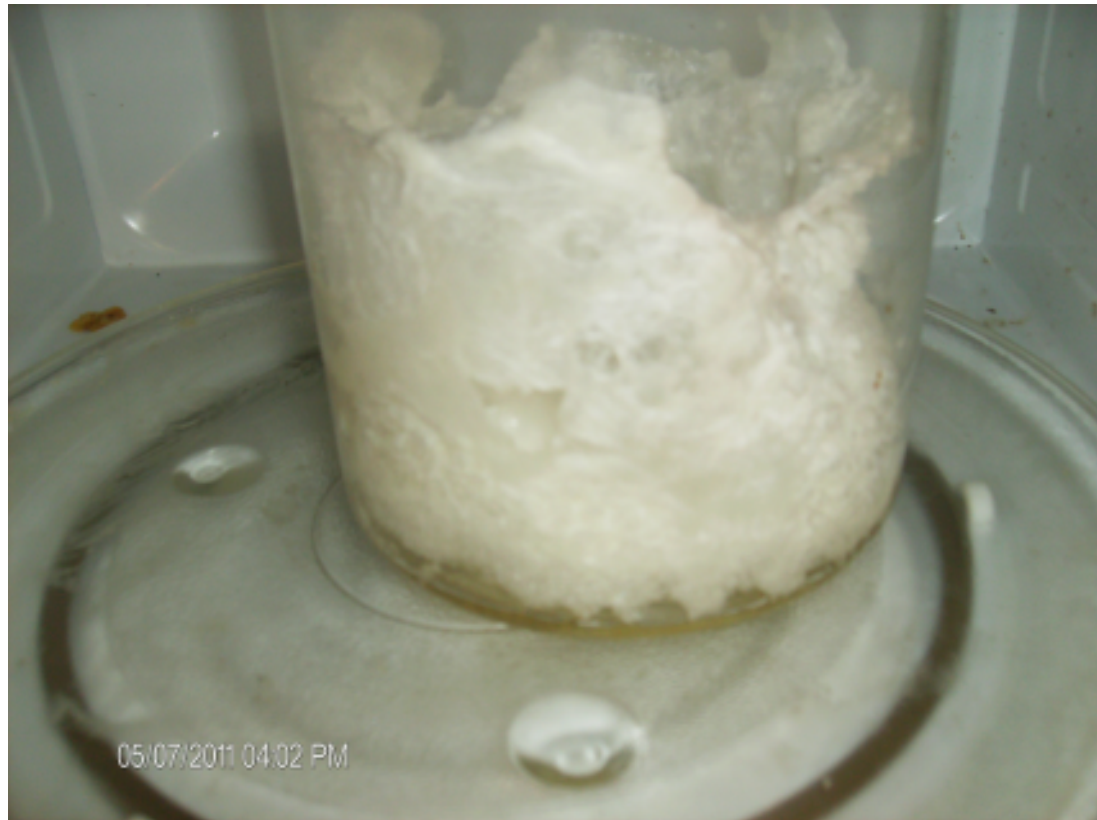
Cold-Process Soap

What happens when you microwave cold-process soap?



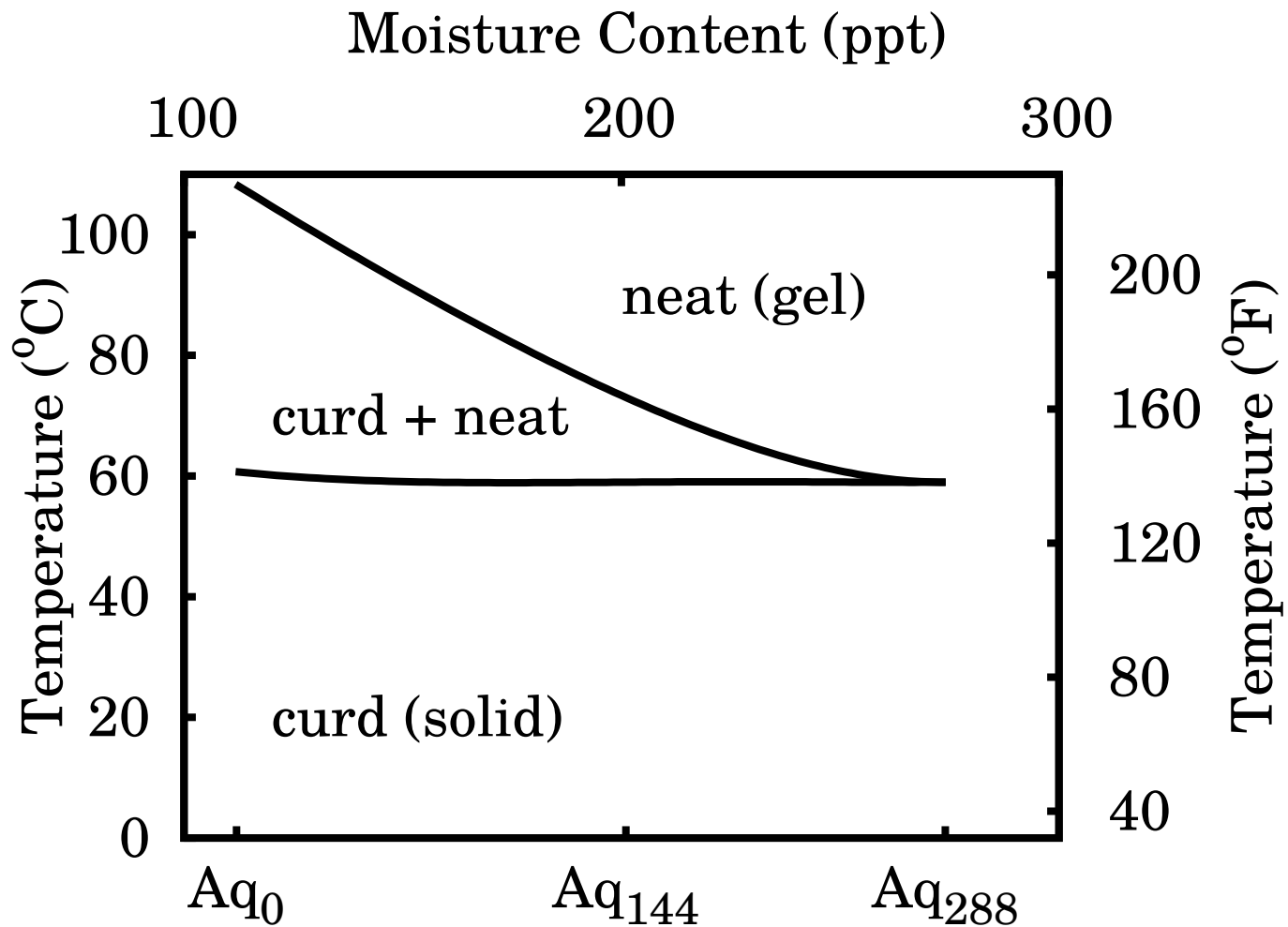
Cold-Process Soap

What happens when you microwave cold-process soap?



Why?

Soap Phases



Soap Solvents

We need a solvent with a boiling point higher than the melting point of soap.

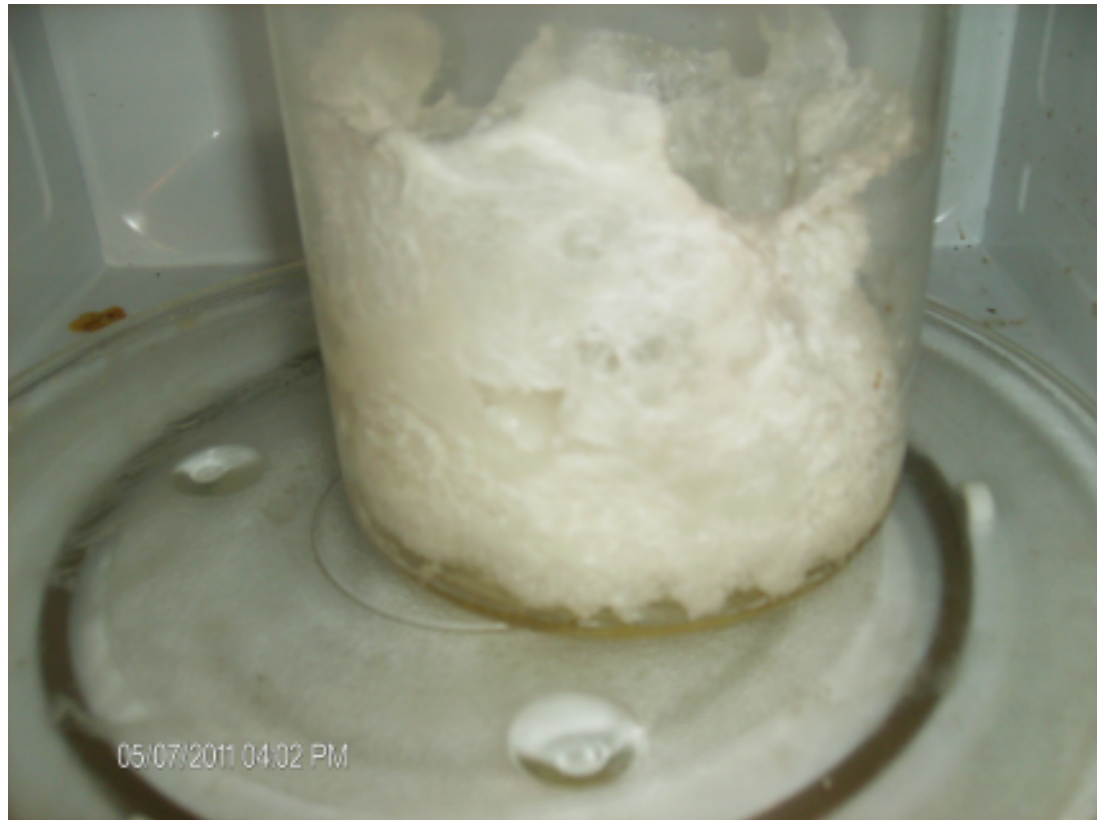
- Ethanol (78°C, 173°F)
- Water (100°C, 212°F)
- Propylene Glycol (188°C, 371°F)
- Glycerol (290°C, 554°F)

Dunn's Simple Melt&Pour Soap

- CP soap: Coconut₉₀₀Castor₁₀₀Lye₃₄₁
- Soap₆₆₇Glycerol₃₃₃

CP soap is shredded with a cheese grater into a beaker. Half its weight of glycerol is added, and the mixture is microwaved for 15 sec at a time. Much frothing and steaming will ensue; just stir the froth into the glycerol between microwave bursts. Eventually, the water will boil away and the soap will dissolve. I used 90% coconut / 10% castor oil, but you can try other combinations. More glycerol will lower the melting point, but increase the “sweatiness.”

Dunn's Simple Melt&Pour Soap



Dunn's Simple Melt&Pour Soap



Dunn's Simple Melt&Pour Soap



Dunn's Simple Melt&Pour Soap

- *Contains only soap and glycerol!*
- *It melts and pours!*
- *It's non-transparent!*

Transparency



Quartz (wikipedia.org/wiki/Quartz)

Transparency



Sand ([wikipedia.org/wiki/Sand](https://en.wikipedia.org/wiki/Sand))

Transparency



Glass ([wikipedia.org/wiki/Glass](https://en.wikipedia.org/wiki/Glass))

Transparency



Rock Candy (wikipedia.org/wiki/Rock_candy)

Transparency



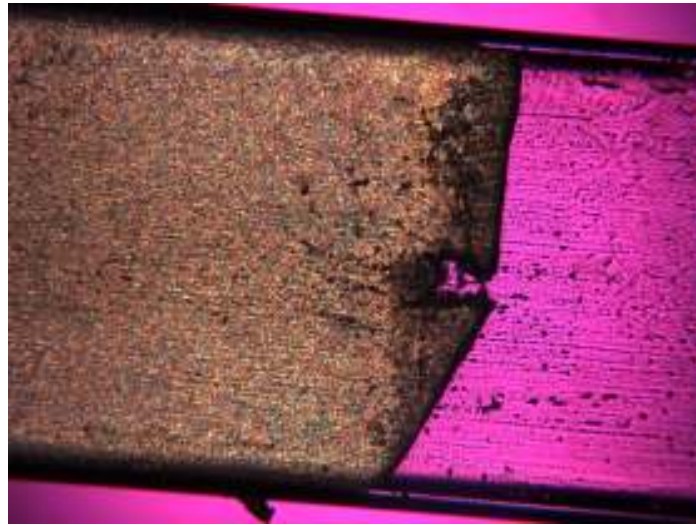
Sugar (wikipedia.org/wiki/Sugar)

Transparency



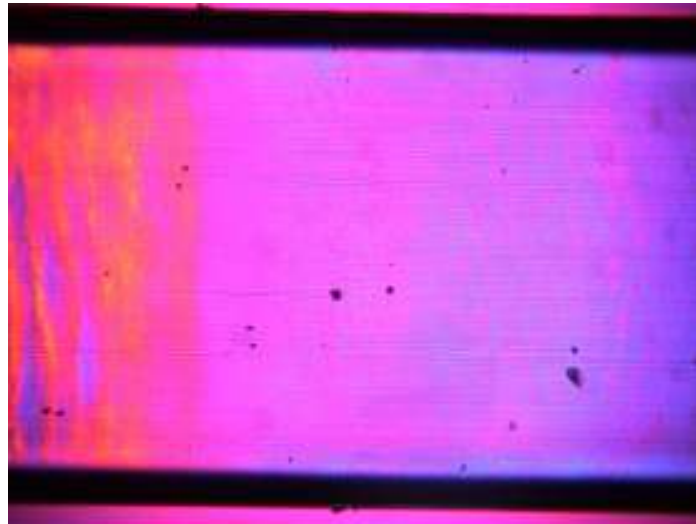
Honey (wikipedia.org/wiki/Honey)

Transparency



Opaque MP Soap Under Polarized Light (40X)

Transparency



Transparent MP Soap Under Polarized Light (40X)

Transparency vs Color

Transparent:

- Honey
- Colored Glass
- Red Wine

Transparency vs Color

Transparent:

- Honey
- Colored Glass
- Red Wine

Colorless:

- Corn Syrup
- Window Glass
- White Wine

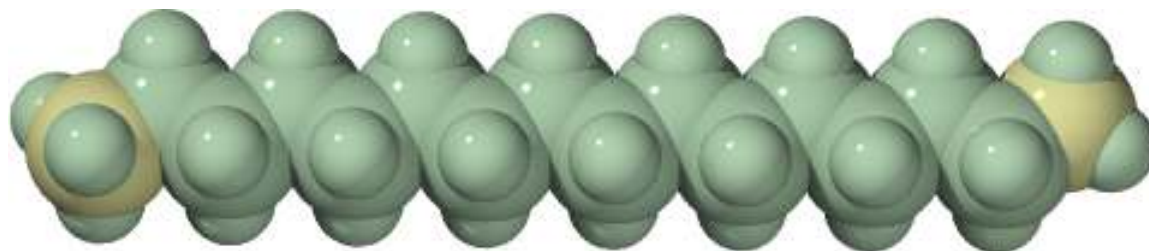
Transparency

The industry standard for transparency is that 14-point type should be legible when read through a 1/4 inch slab. Commercial transparent MP soap usually exceeds this standard significantly.

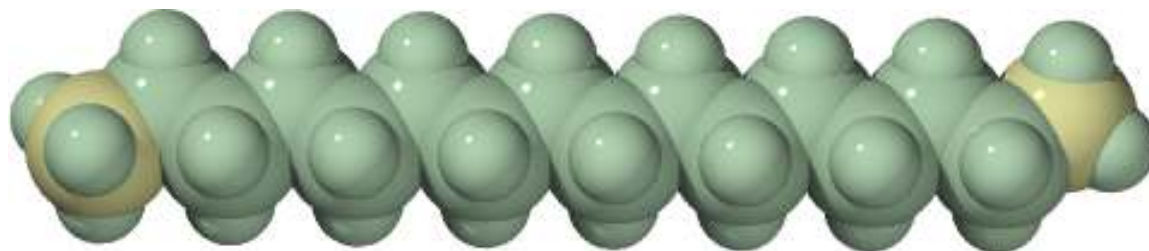
Background Chemistry

Oil and water don't mix.

Oil and Water



Nerds and Cheerleaders

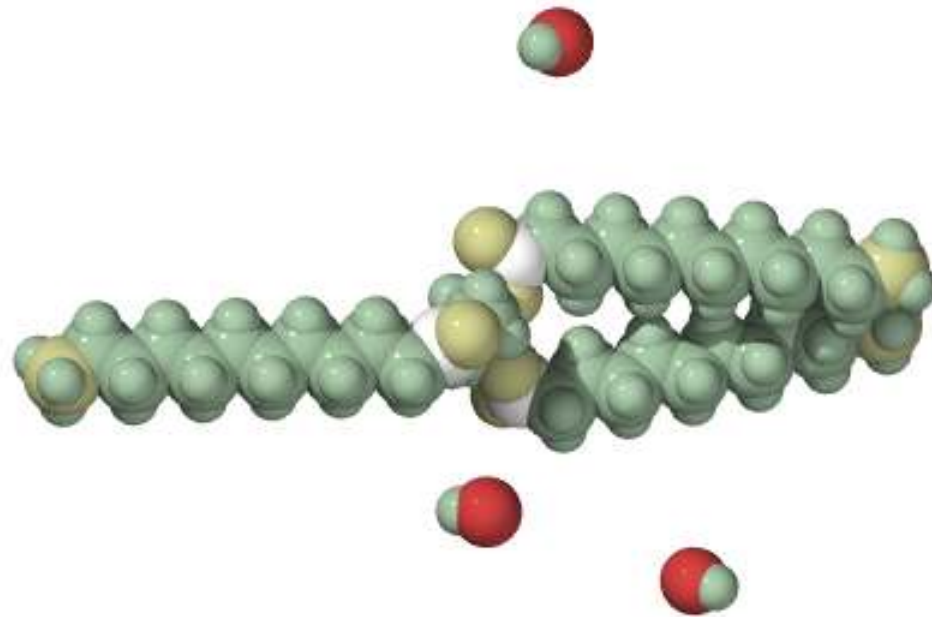


Lipophilic

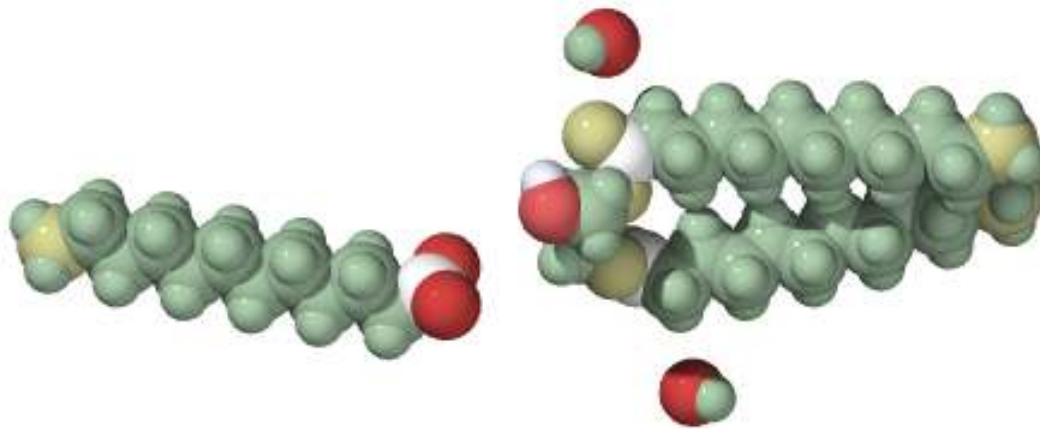


Hydrophilic

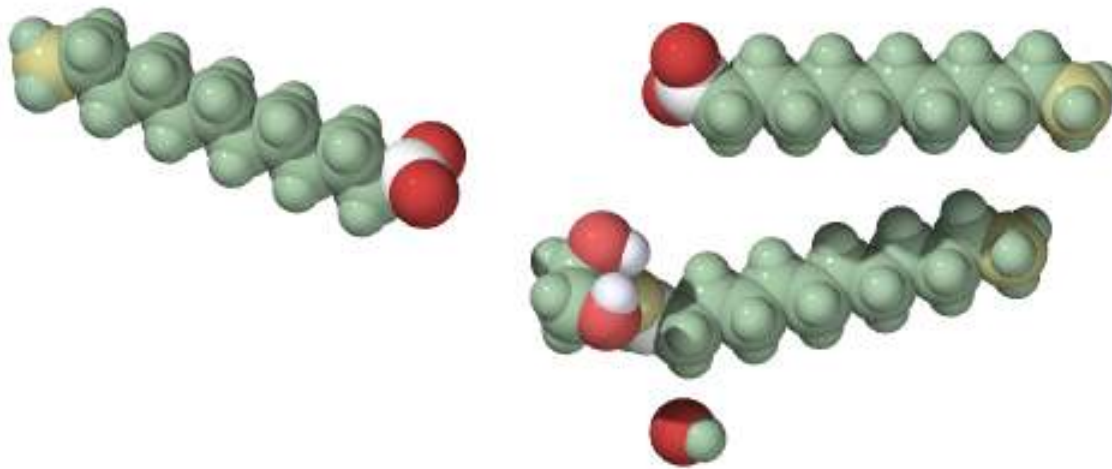
Oil and Lye



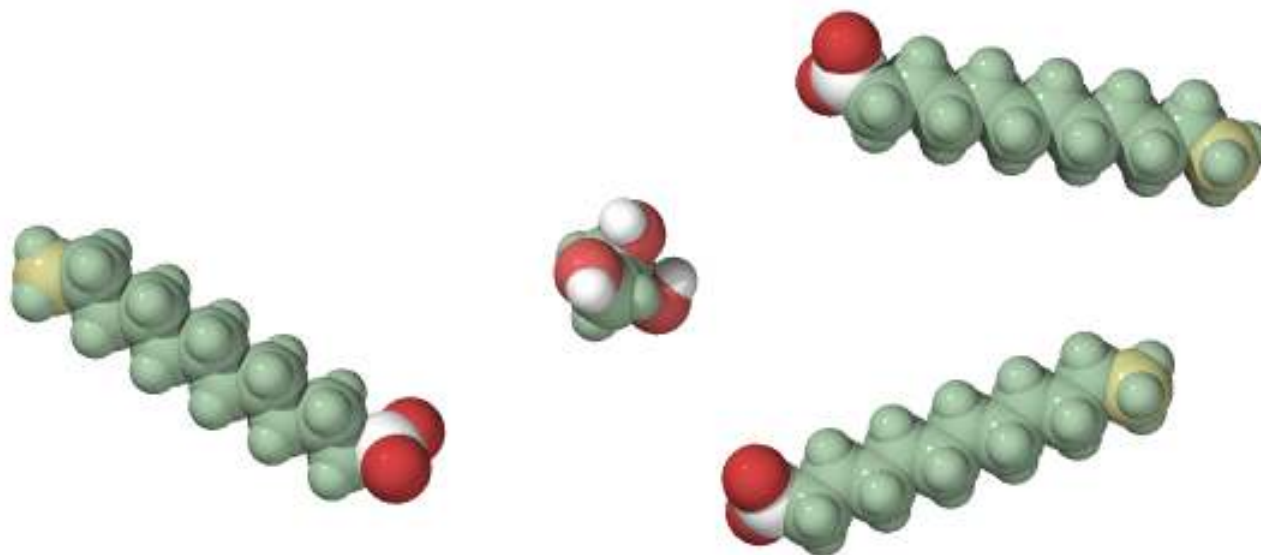
One Soap



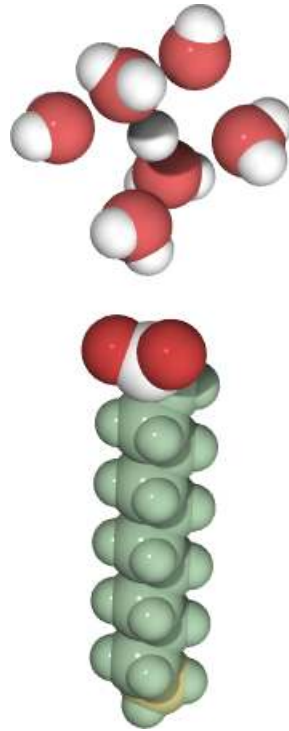
Two Soaps



Three Soaps and a Glycerin

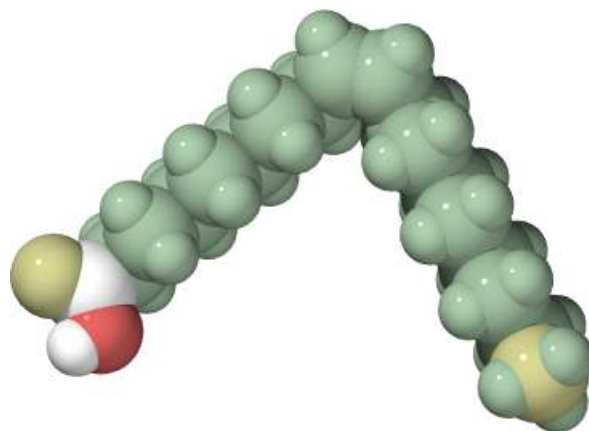
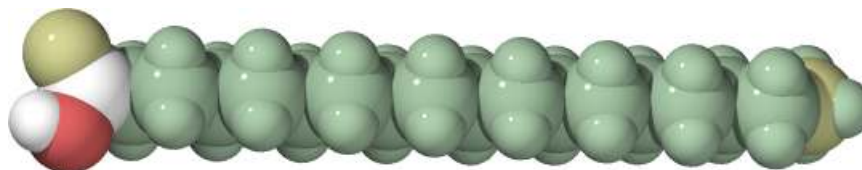


Soap: A Nerdy Cheerleader

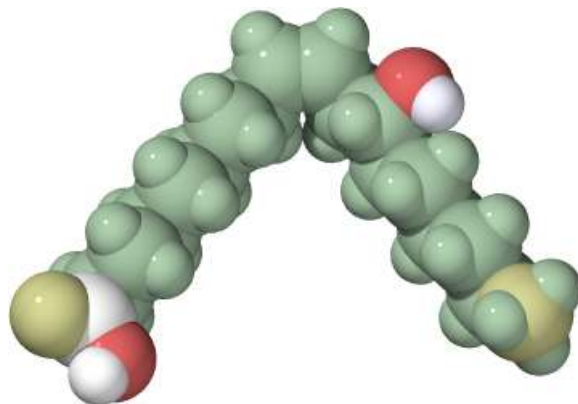


Amphiphilic

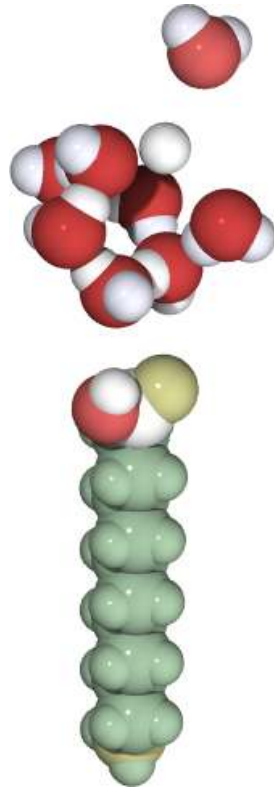
Stearic Acid, Oleic Acid



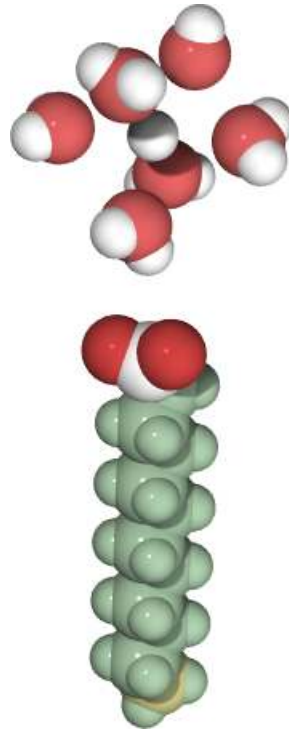
Ricinoleic Acid



Fatty Acid + Lye



Fatty Acid + Lye = Soap



Two Ways to Make Soap

From Oil

- Oil + 3 NaOH = Glycerol + 3 NaSoap
- Fairly slow, 1-4 hours

Two Ways to Make Soap

From Oil

- $\text{Oil} + 3 \text{ NaOH} = \text{Glycerol} + 3 \text{ NaSoap}$
- Fairly slow, 1-4 hours

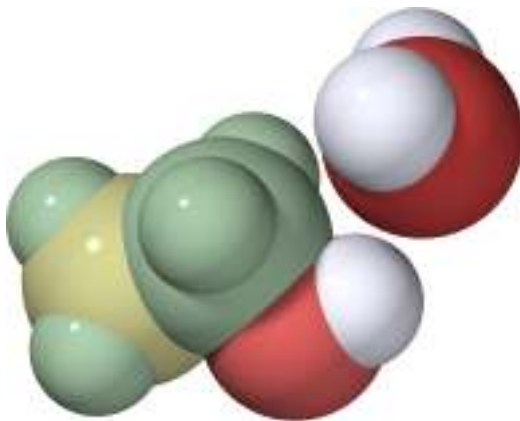
From Fatty Acid

- $\text{FattyAcid} + \text{NaOH} = \text{Water} + \text{NaSoap}$
- Fairly rapid, seconds

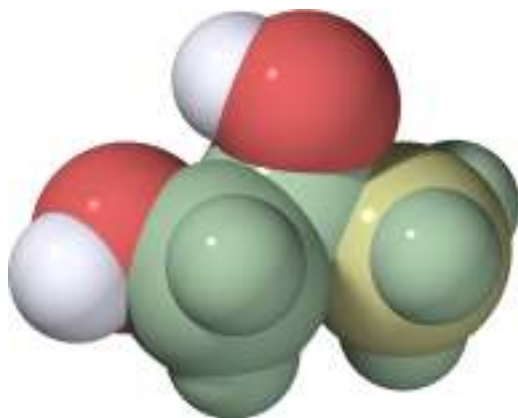
Solvents: Water



Solvents: Ethanol



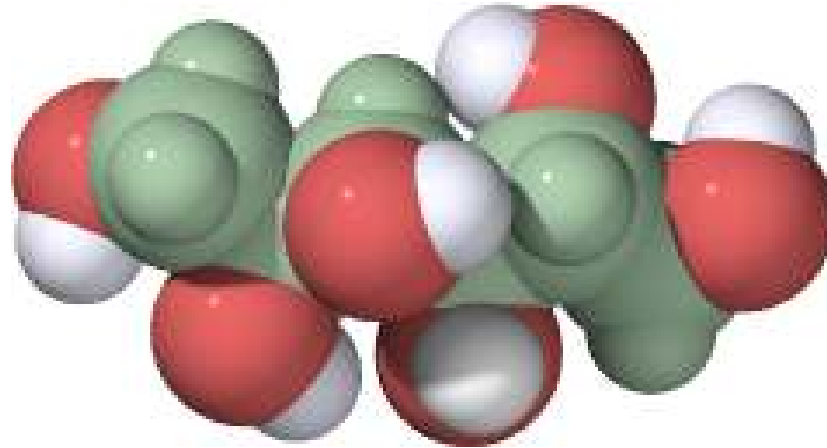
Solvents: Propylene Glycol



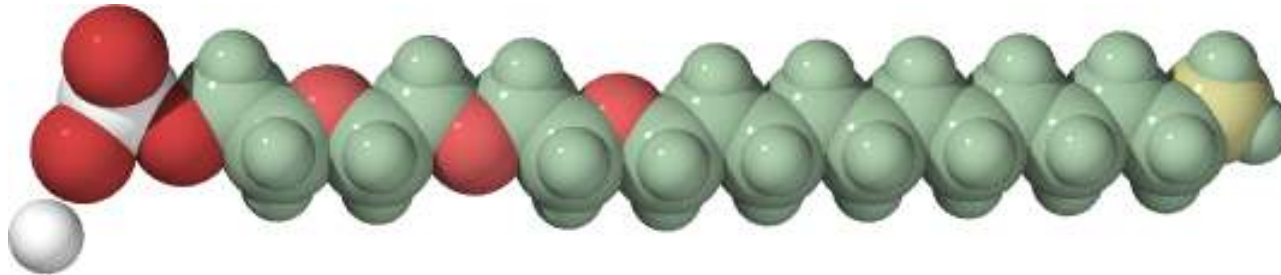
Solvents: Glycerol



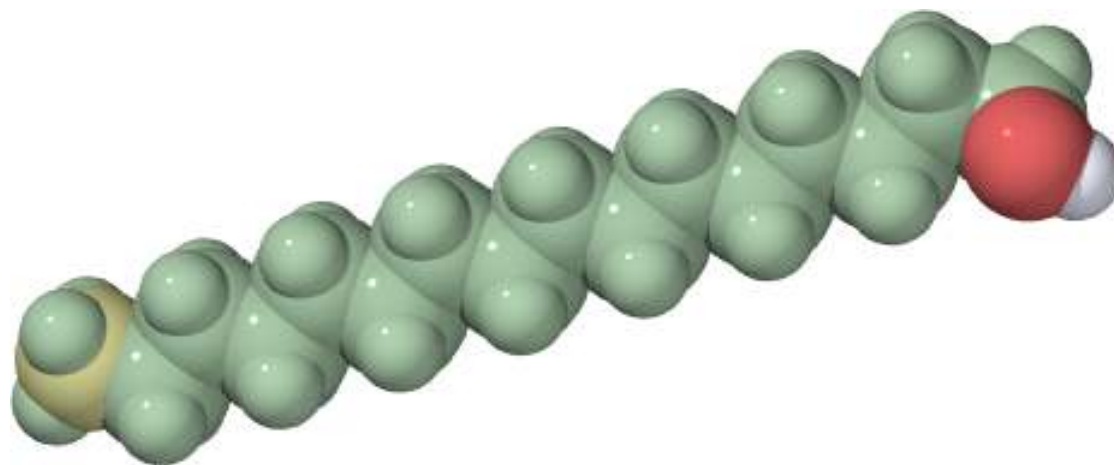
Solvents: Sorbitol



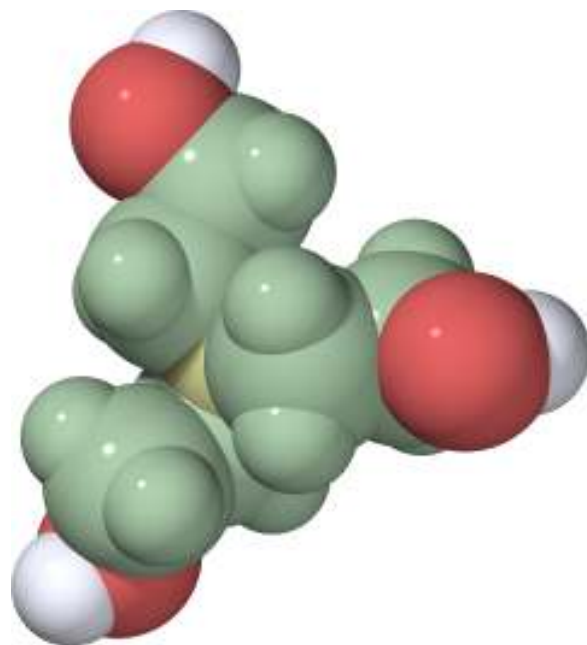
Detergents: Sodium Laureth Sulfate



Fatty Alcohols: Cetyl Alcohol



Mild Alcohol-Soluble Alkali: Triethanolamine



Transparent Soap

Thomssen and Kemp (1939):

- 22% Coconut Oil
- 14% Tallow
- 7% Castor Oil
- 23% Lye
- 11% *Ethanol*
- 10% Sugar
- 6% Glycerol
- 6% *Water*
- 1% Color, Scent

Transparent Soap

Thomssen and Kemp (1939):

- *Contains only soap and solvents!*
- *It's transparent!*
- It does not melt or pour (why not?)

Transparent Soap

Thomssen and Kemp (1939):

66% Soap

- 22% Coconut Oil
- 14% Tallow
- 7% Castor Oil
- 23% Lye

33% Solvents

- 11% *Ethanol*
- 10% Sugar
- 6% Glycerol
- 6% *Water*

Crosby's Transparent MP Soap

Soap Version:

- 31% CP Coconut₉₀₀ Castor₁₀₀ Lye₃₄₁
- 63% Glycerol
- 4% Cetyl Alcohol
- 2% Sorbitol

Crosby's Transparent MP Soap

Soap Version:

- CP Coconut₂₀₉Castor₂₄Lye₈₀
- Glycerol₆₃₀
- Cetyl Alcohol₄₀
- Sorbitol₂₀

Crosby's Transparent MP Soap

Soap Version:

Make up the CP Coconut/Castor-oil soap in advance and shave it with a cheese grater. Add glycerol, cetyl alcohol, and sorbitol. Heat on a hotplate until everything is fully dissolved and the solution is transparent. Pour into mold.

Crosby's Transparent MP Soap

Soap Version:

- *Contains only soap and solvents!*
- *It melts and pours!*
- *It's transparent amber!*
- It sweats when exposed to humid air.

Soap samples are labeled with red stickers.

Crosby's Transparent MP Soap

Soap Version:

31% Soap

- 28% Coconut Oil Soap
- 3% Castor Oil Soap

69% Solvents

- 63% Glycerol
- 4% Cetyl Alcohol
- 2% Sorbitol

Crosby's Transparent MP Soap

Fatty Acid Version:

- StearicAcid₁₉₂
- MyristicAcid₉₆
- Lye₈₈
- Glycerol₅₇₇
- TEA₄₇

Crosby's Transparent MP Soap

Fatty Acid Version:

Add all ingredients. Heat on a hotplate until everything is fully dissolved and the solution is transparent. Pour into mold.

Crosby's Transparent MP Soap

Fatty Acid Version:

- *Contains only soap, solvents, and mild base!*
- *It melts and pours!*
- *It's transparent and colorless!*
- It sweats when exposed to humid air.

Soap samples are unlabeled.

Crosby's Transparent MP Soap

Fatty Acid Version:

34% Soap

- 23% Sodium Stearate
- 11% Sodium Myristate

62% Solvent, 4% Mild Alkali

- 58% Glycerol
- 4% Water
- 4% TEA

Dunn's Castor Transparent MP Soap

- 25% CP Coconut₁₀₀₀Lye₃₅₂
- 25% HP Castor₁₀₀₀Lye₂₂₇ (superfatted)
- 50% Glycerol

Dunn's Castor Transparent MP Soap

- CP Coconut₁₈₅Lye₆₅
- HP Castor₂₀₄Lye₄₆
- Glycerol₅₀₀

Dunn's Castor Transparent MP Soap

Make up the CP Coconut-oil soap in advance and shave it with a cheese grater. Add the desired amount amount of castor oil and Lye to a beaker and heat in the microwave to about 60°C (140°F). This “lights” the saponification. Allow it to cool back to 60°C (140°F), thus ensuring that the saponification is largely complete. Add coconut soap shavings and glycerol. Heat in the microwave until everything is fully dissolved and the solution is transparent. Pour into mold.

Dunn's Castor Transparent MP Soap

- *Contains only soap and glycerol!*
- *It melts and pours!*
- *It's transparent!*
- It sweats, but sweats transparently.

Tweaked Transparent MP Soap

51% Soap

- 27% Superfatted Castor Oil Soap
- 24% Coconut Oil Soap

49% Solvents

- 43% Glycerol
- 6% Water (partially cooked off)

Same as before, but with less glycerol. Less transparent than the previous formula, but also less sweaty. These are the sample heart soaps.

Gammon/Saxton MP Soap

A variation on one of Fioravanti's formulas, but with no propylene glycol

- SodiumLaurethSulfate₂₆₁
- StearicAcid₁₁₄
- MyristicAcid₅₃
- Lye₅₂
- Glycerol₃₂₆
- Sorbitol (70% solution)₁₇₁
- TEA₂₃

Gammon/Saxton MP Soap

Add all ingredients. Heat on a hotplate until everything is fully dissolved and the solution is transparent. Pour into mold.

Gammon/Saxton MP Soap

- *Contains no propylene glycol!*
- *It melts and pours!*
- *It's transparent and colorless!*
- *It does not sweat!*

These samples are labeled with blue stickers.

Gammon/Saxton MP Soap

26% Detergent

- 26% Sodium Laureth Sulfate

19% Soap

- 13% Sodium Stearate
- 6% Sodium Myristate

53% Solvents, 2% Mild Alkali

- 33% Glycerol
- 12% Sorbitol
- 8% Water (partially cooked off)
- 2% TEA

Melt and Pour

MP soap can be made from CP soap by rebatching with glycerol instead of water.

- Start at 2 parts soap to 1 part glycerol
- Increase glycerol portion for more transparency
- Decrease glycerol portion for less sweating

Transparency

Transparent MP soap can be made from CP or HP soap or from fatty acids.

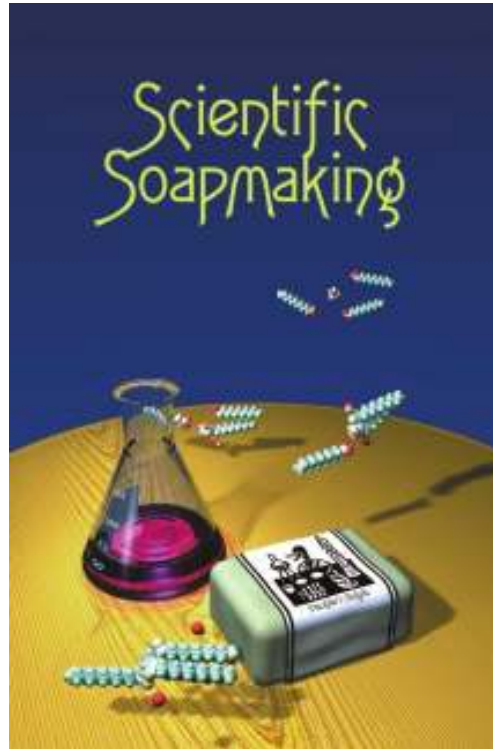
- MP soap from fatty acids have less residual color
- HP castor oil soap improves transparency

Sweating

Transparent MP soaps absorb water from the air because of their high glycerol concentration.

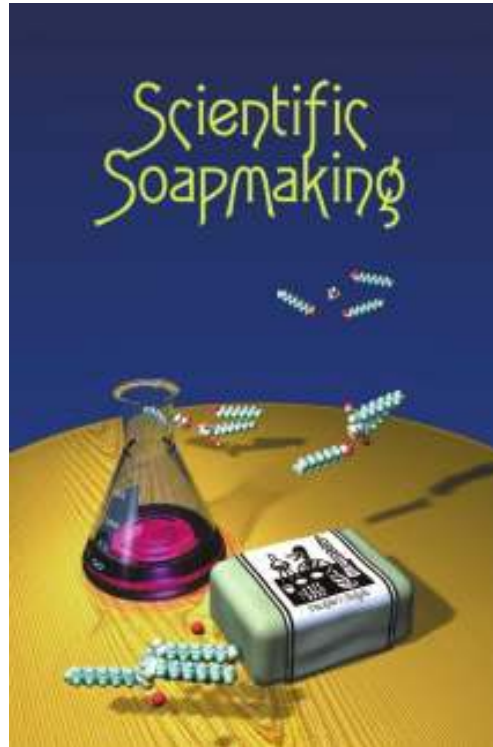
- Including SLES reduces the need for glycerol
- SLES MP soaps sweat less than those without SLES

Scientific Soapmaking



Thanks to the HSMG for all the questions I could not have answered 6 years ago.

Scientific Soapmaking



Thanks to the HSMG for all the questions I may be able to answer in the coming years.