

Periodic graphics

A collaboration between C&EN and Andy Brunning, author of the popular graphics blog **Compound Interest**

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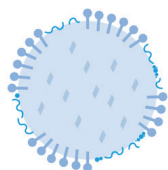
To see more of Brunning's work, go to compoundchem.com. To see all of C&EN's Periodic Graphics, visit cenm.ag/periodicgraphics.

THE CHEMISTRY OF FROZEN DESSERTS

During summer, you can turn to a dizzying array of frozen desserts for refreshment. Here's a handy guide to help you tell your ice cream from your gelato.

COMPOSITION & STRUCTURE

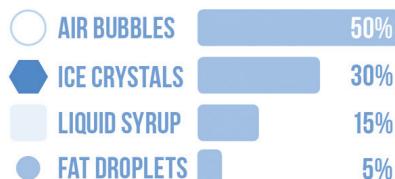
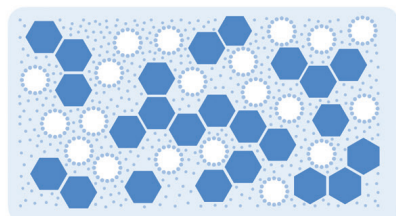
A mix of air, ice crystals, liquid syrup, and fat droplets make up most frozen desserts. These ingredients form a solution in which the droplets of fat are suspended. Milk proteins stop fat droplets from coalescing, while emulsifiers help multiple fat droplets trap air.



A SINGLE FAT DROPLET

- LIQUID FAT
- ⌘ EMULSIFIER MOLECULES
- ⌘ MILK PROTEINS
- ◆ FROZEN FAT CRYSTALS

The fat droplets make frozen desserts creamy and also help stabilize the air bubbles formed during beating and aeration. Ice crystals help determine the texture: the smaller the crystals, the smoother the dessert.



% by volume for typical composition of ice cream

ICE CREAM



MORE CREAM
THAN MILK;
CHURNED FAST

10–20%
FAT CONTENT
BY WEIGHT

20–100% OVERRUN*

GELATO



MORE MILK
THAN CREAM;
LESS AIR THAN ICE CREAM

3–8%
FAT CONTENT
BY WEIGHT

20–30% OVERRUN

SOFT SERVE



LESS MILK
FAT THAN
ICE CREAM;
LIGHT AND FLUFFY

3–10%
FAT CONTENT
BY WEIGHT

30–60% OVERRUN

FROZEN YOGURT



INCLUDES YOGURT
CULTURES;
MORE SUGAR THAN
ICE CREAM

0.5–3%
FAT CONTENT
BY WEIGHT

50–60% OVERRUN

*See below; premium brands have a lower overrun than economy brands do.

AIR & OVERRUN

THICK AND DENSE PRODUCT;
SLOWER MELTING

0% OVERRUN 100%

LIGHT AND FLUFFY PRODUCT;
FASTER MELTING

Overrun refers to the amount of air added to frozen desserts. It is the increase in volume of a frozen treat as air gets incorporated during manufacture, expressed as a percentage.

SHERBET & SORBET

0%

FAT CONTENT
BY WEIGHT

SORBET

Sherbet and sorbet both contain less dairy than ice cream does. Sorbet contains none at all and is just fruit and sugar, while sherbet contains a little milk or cream, giving it a smoother feel.

SHERBET

1%

FAT CONTENT
BY WEIGHT



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