The Science of Space Dust

Science at Home regularly examines the property of confectionery (The Lemonade and Mentos Fountain, From Sherbet to Popping Sandwich Bags). The eating experience of food in general but sweets and desserts in particular is a combination of taste, smell and mouthfeel. Taste and small when combined are termed flavour, which curiously is much more smell than taste. *Mouthfeel* is all about texture, and, for example it is surprising how small differences in particle size cause a significant difference in mouthfeel. The creaminess associated with ice cream is caused by a certain particle size of both fat particles and ice crystals. If the ice crystals get too large, the ice cream loses its creamy texture and feels harsh and abrasive. The qualities that encapsulate the concept of mouthfeel include:

Brittleness	Cohesiveness	Crispiness
Crumbliness	Crunchiness	Density
Dryness	Fracturability	Graininess
Gumminess	Hardness	Heaviness
Moisture Release	Mouthcoating	Roughness
Slipperiness	Smoothness	Uniformity
Uniformity of Bite	Viscosity	Uniformity of Chew
Wetness		

Some sweets rely almost solely on mouthfeel and have little if any taste. Sherbet tastes tart and fizzy since it contains citric acid (tart) and releases carbon dioxide (fizzy).

Space Dust (aka Pop Rocks) is a rocky type of bagged sweet which was in vogue in the early 1980's but has been around for longer. Although it is supplied in various flavours, like sherbet, it relies mainly on mouth sensation for its uniqueness. The sensation that is experienced when chewing Space Dust is of very small detonation in your mouth; this led to an urban legend that when Space Dust was drank with soda, there was a risk of the user's stomach exploding which resulted in the product being temporarily discontinued in 1983 in the USA.

In this experiment we will demonstrate that a small crystal of Space Dust contains more than its volume of carbon dioxide, this being made possible due to the manufacturing process which causes pressurized carbon dioxide to be trapped within the crystals of space dust.

MATERIALS

You will need:

- Space Dust (available on ebay as branded Fizz Wizz, 10 packets for £1.37 + £0.76 postage);
- A table spoon OR a pestle and mortar;
- A 0.5 L soda bottle;
- A balloon;
- A narrow-mouthed jar.

HEALTH & SAFETY

There are no particular Health and safety issues connected with this experiment.

EXPERIMENT 1

Eat some Space Dust and feel the pop when you chew the rocks.

EXPERIMENT 2: CRUSHING SPACE DUST

In this demonstration the pop caused when chewing Space Dust can be seen remotely. Place some crystals on a hard surface or in the mortar and crush them with the back of the spoon or the pestle. As the crystal ruptures the carbon dioxide rapidly escapes causing a pop. This is directly analogous to a balloon popping.

EXPERIMENT 3: MEASURING THE AMOUNT OF CARBON DIOXIDE IN SPACE DUST

Pour an entire bag of Space Dust into the empty balloon. Attach the balloon to the neck of the full soda bottle, but do not let the Space Dust fall into the soda. After the balloon is attached, you can lift up on the balloon to allow all of the Space Dust to fall into the soda. The balloon should inflate.

EXPLANATION

Space dust contains sugars (sucrose, lactose, glucose, artificial flavour, and carbon dioxide). The sweets are prepared as any other, by melting the sugars and fusing them into rocks/crystals but this is done under fairly high pressure of carbon dioxide (600 psi) which causes bubbles of pressurized CO_2 to be trapped within the crystals. Curiously, you may have noticed that the balloon doesn't inflate very much at all, so you might conclude that there isn't much CO_2 within the packet of Space Dust and you would be correct. But there is even less than this experiment has shown. As Science at Home has demonstrated (The Lemonade and Mentos Fountain) adding anything with rough edges to soda causes the dissolved carbon dioxide to come out of solution more quickly. Most of the CO_2 in the balloon is therefore from the soda and not from the Space Dust. We have therefore conclusively demonstrated the low likelihood of Space Dust eaters' stomachs exploding thus debunking an urban myth.

This article is based on an idea originally seen at Steve Spangler Science