

Chemistry: Chemistry of Fragrances

Week 03/30/20

Reading:

- Annotate the article: [How sweat might make you smell sweeter?](#)
 - Underline important ideas
 - Circle important words
 - Put a “?” next to something you want to know more about

Activity:

- Design your signature perfume scent
 - Read the article: [Chemistry of Fragrances](#)
 - Using the information from both articles design your signature perfume scent on the Perfume Design Challenge Card below.

Writing:

- Explain why you choose the ingredients in your Signature Perfume Recipe.
 - Be sure to use evidence from both articles and provide justification for your recipe design.

Signature Perfume Design Challenge

Scent Name:
Perfume Scientist Name:

Ingredients:

Directions:

CHEMISTRY

How sweat might make you smell sweeter

Scientists have developed a fragrance-delivery system that works overtime when you perspire



Chemist Nimal Gunaratne (right) at Queen's University Belfast helped develop a perfume delivery system that works harder as someone sweats.

QUEEN'S UNIVERSITY BELFAST

By **Sharon Oosthoek**

April 28, 2015 at 6:00 am

Scientists have created a scent-delivery system that releases a pleasant fragrance when you sweat. Apply it to the skin, and the more you sweat the better you'll smell. That's because the perfume only gets released upon contact with moisture.

Chemists at Queen's University Belfast in Northern Ireland combined two compounds to create their new system. One chemical is alcohol-based. This is the nice-smelling perfume. The other chemical is an ionic liquid. It's a type of salt that is liquid at room temperature.

Ionic liquids are made of ions — molecules that have lost or gained one or more electrons. If the molecule loses electrons, it will have a positive charge. If it gains electrons, it gets a negative charge. Ionic liquids contain the same number of positive and negative ions. This makes the liquid neutral, with no overall electric charge. In general, ionic liquids also have no smell.

When the perfume and ionic liquid are mixed together, a chemical reaction occurs. This bonds the molecules to each other. The reaction also temporarily inactivates the perfume's molecules. So when applied to the skin, the new perfume initially has no scent.

But adding water — or sweat — breaks the bond between the molecules. That releases the scent into the air. The researchers experimented with two different fragrances. One smelled musky. The other had a sweet, fruity smell.

“The rate of release of the fragrance material depends on how much you sweat, in other words how much water is available,” explains chemist Nimal Gunaratne. “Sweat is like the command to let the fragrance go.”

Gunaratne works at the university's Ionic Liquid Laboratories. He led the new research.

Other chemists have created similar systems that release a fragrance after contact with water that has a very basic or very acidic pH. Because sweat is only slightly acidic, it would not release enough of the fragrance to work as a perfume. Gunaratne's system on the other hand, will release its fragrance in the presence of any water — acidic, basic or neutral, says Christian Quellet.

Quellet is a chemist who has worked in the fragrance industry for a long time. He is now an independent consultant based in Biel-Bienne, Switzerland. Gunaratne's perfume “opens the door to new developments and applications of fragrance controlled-release systems,” he says. Controlled-release systems allow small quantities of some compound that they hold to slowly enter the environment. Some implanted in the body can slowly release a drug over time. Others might slowly release a chemical into the air or soil.

Gunaratne and his team described their new research on March 14 in the journal *Chemical Communications*.

Their system also traps some chemicals in sweat that are responsible for that stinky sweat smell. These compounds are called *thiols*. Just as water does, thiols break apart the bond that ties the perfume to the ionic liquid.

When this happens, the thiols then attach to the ionic liquid and their stinky scent is inactivated as the perfume had been.

This means that the water in sweat, and its stinky thiols are both able to release the fragrance from the newly developed perfume.

Power Words

(for more about Power Words, click [here](#))

acidic An adjective for materials that contain acid. These materials often are capable of eating away at some minerals such as carbonate, or preventing their formation in the first place.

base (in chemistry) A chemical that produces hydroxide ions (OH^-) in a solution. Basic solutions are also referred to as **alkaline**.

bond (in chemistry) A semi-permanent attachment between atoms — or groups of atoms — in a molecule. It's formed by an attractive force between the participating atoms. Once bonded, the atoms will work as a unit. To separate the component atoms, energy must be supplied to the molecule as heat or some other type of radiation.

chemical A substance formed from two or more atoms that unite (become bonded together) in a fixed proportion and structure. For example, water is a chemical made of two hydrogen atoms bonded to one oxygen atom. Its chemical symbol is H_2O .

chemical reaction A process that involves the rearrangement of the molecules or structure of a substance, as opposed to a change in physical form (as from a solid to a gas).

chemistry The field of science that deals with the composition, structure and properties of substances and how they interact with one another. Chemists use this knowledge to study unfamiliar substances, to reproduce large quantities of useful substances or to design and

create new and useful substances. (about compounds) The term is used to refer to the recipe of a compound, the way it's produced or some of its properties.

compound (often used as a synonym for chemical) A compound is a substance formed from two or more chemical elements united in fixed proportions. For example, water is a compound made of two hydrogen atoms bonded to one oxygen atom. Its chemical symbol is H_2O .

consultant Someone who performs work as an outside expert, usually for a company or industry. "Independent" consultants often work alone, as individuals who sign a contract to share their expert advice or analytical skills for a short time with a company or other organization.

ion An atom or molecule with an electric charge due to the loss or gain of one or more electrons.

ionic liquid A salt that is liquid, often below boiling temperatures — sometimes even at room temperature.

molecule An electrically neutral group of atoms that represents the smallest possible amount of a chemical compound. Molecules can be made of single types of atoms or of different types. For example, the oxygen in the air is made of two oxygen atoms (O_2), but water is made of two hydrogen atoms and one oxygen atom (H_2O).

musk The substance with a persistent and pungent smell that is released by male musk deer (from a sac under their skin). This material, or synthetic chemicals that resemble it, are used to give many perfumes a deep and complex "animal" scent.

pH A measure of a solution's acidity. A pH of 7 is perfectly neutral. Acids have a pH lower than 7; the farther from 7, the stronger the acid. Alkaline solutions, called bases, have a pH higher than 7; again, the farther above 7, the stronger the base.

thiol An organic chemical that is similar to an alcohol, but instead of containing a hydroxyl group — an oxygen and hydrogen atom bound together — they have a sulfur atom bonded to the hydrogen. These chemicals often have a very strong and pungent — even repulsive — scent.

NGSS: [HS-PS1-2](#), [HS-PS1-4](#), [MS-PS1-2](#)

CITATIONS

S. Ornes. "[The scent of a woman — or a man.](#)" *Science News for Students*. May 12, 2014.

S. Ornes. "[The nose knows a trillion scents.](#)" *Science News for Students*. April 7, 2014.

R. Kwok. "[Secret signals.](#)" *Science News for Students*. January 15, 2013

P. Wysong. "[Cool Jobs: Scents of science.](#)" *Science News for Students*. September 12, 2012.

S. Ornes. "[Whale-free perfume.](#)" *Science News for Students*. July 9, 2012.

S. Ornes. "[The smell of old people.](#)" *Science News for Students*. June 14, 2012.

Original Journal Source: N. Gunaratne et al. [Pro-fragrant ionic liquids with stable hemiacetal motifs: Water-triggered release of fragrances.](#) *Chemical Communications*. Published March 14, 2015. DOI: 10.1039/c5cc00099h.