Intriguing elements

There are 118 elements in the periodic table, many of which have fascinating and surprising properties. **Lacey Aspinall** introduces a few examples

Gallium

31
Ga

Gallium, a silvery metal, is a material loved by practical jokers. For example, people would mould it to make a teaspoon, but when used to stir a cup of tea the spoon would disappear into the drink, as if being 'eaten' by the tea (of course it would not be sensible to drink the tea). This is due to its remarkably low melting point of 29.76°C (Chemistry Review Vol. 30, No. 3, p. 34).

Gallium has a boiling point of over 2200°C, giving it one of the largest temperature ranges between its melting and boiling points of all the elements. With such a wide liquid temperature range, gallium is used to make thermometers. It is also used in electronic circuits and LEDs (light-emitting diodes, Chemistry Review Vol. 19, No. 4, pp. 8–11).

Gallium melting in a hand

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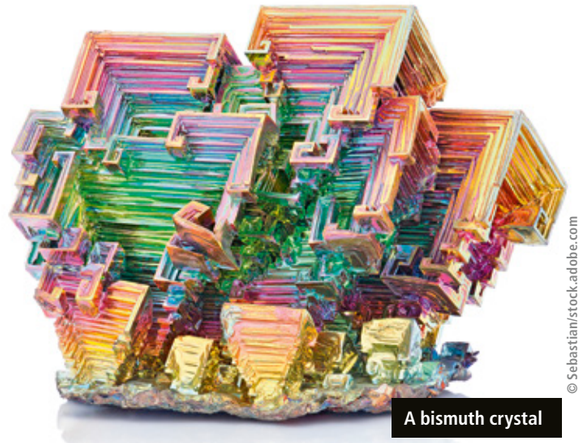
Bismuth

83
Bi

Bismuth is like a rainbow captured in an element. It forms a staircase-like crystal, with a silver-pink hue. The outer layer of the metal becomes oxidised in the air and light reflects from the top and bottom of the oxidised layer. The reflected light waves are offset by the different distances they have had to travel. Some wavelengths (colours) undergo destructive interference (cancelling them out), while other wavelengths are reinforced through constructive interference. This gives rise to a rainbow effect, as the thickness of the oxide layer varies across the surface, in a similar way to the colours seen in bubbles.

Bismuth burns with a blue flame and releases yellow fumes. Its colourful properties make it useful in paints, dyes and fireworks.

Not only is bismuth colourful, but it can make other metals levitate. It is *diamagnetic*, which means that it is repelled by a magnetic field. So, when you put a magnetic metal between two pieces of bismuth, the repulsive force from the bismuth causes the metal to float.



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A bismuth crystal

Mercury

80
Hg

Mercury, nicknamed 'quicksilver' due to its mobility, is named after the fastest moving planet in the solar system. Its atomic symbol (Hg) comes from 'hydrargyrum', which derives from the ancient Greek, meaning 'water silver' – a fitting description of its appearance.

Mercury has had many uses throughout history. Alchemists tried combining it with other metals to turn it into gold (without any luck, sadly). In the 1800s mercury nitrate was used to make wool hats softer. As it is a very toxic metal, it caused brain damage and 'madness', which led to the saying 'mad as a hatter'. Mercury has also been used as a treatment for many diseases historically, although this mainly resulted in poisoning. In more recent times it has been used in fluorescent lightbulbs, thermometers and thermostats, although many of its applications are being phased out due to its toxicity (Chemistry Review Vol. 24, No. 2, pp. 2–7).

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Mercury

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Arsenic

33
As

Throughout history, arsenic, a metalloid, was a popular choice for potential murderers seeking a poison (Chemistry Review Vol. 28, No. 2, pp. 18–21). From Roman assassins to the ruling classes of Renaissance Italy, and even those escaping domestic violence in the nineteenth century, arsenic was the weapon of choice.

It is tasteless, odourless and colourless. Testing for arsenic was not developed until the mid-nineteenth century, and as its poisoning symptoms closely resemble those of cholera (a common disease throughout history), it often went undetected (Chemistry Review Vol. 30, No. 2, p. 34). In fact, arsenic was so successful as a poison that it was nicknamed 'inheritance powder', as members of royal families used it to take over the throne.

Arsenic does not have a completely dark history though – it was the first 'magic bullet' drug. Arsenic was used to target the bacteria that cause syphilis (a sexually transmitted infection), meaning that this condition was no longer a death sentence. Although arsenic is not used as a drug treatment in humans today, it still has a range of applications, including use in semiconductors.

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Bottle containing arsenic trioxide from around 1900

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