

# Glowing Gases

## More Details

### Spectral fingerprint

The core of a spectrometer is a prism, a triangular piece of glass. It splits up the light ray and thus makes the single colours of which the light consists visible. Sunlight contains all colours from red to violet – the well-known colour spectrum of the rainbow. Other light sources (candlelight, light bulbs, light tubes) have a completely different spectrum than "natural" light. The spectrum depends on the chemical elements or compounds involved in the light. Each element and each substance has its own distinctive spectrum.

### New elements coming up non-stop

It has long been known that different elements burn in different colours: Sodium burns in yellow, potassium in light purple and copper in green. These phenomena can be studied much more precisely with a spectrometer. The German chemist Robert Wilhelm Bunsen, who invented the Bunsen burner, used the spectrometer from 1859 to analyse compounds. For example, he had discovered that certain mineral waters that were rich in sodium and potassium also contained lithium. He wondered whether they might still contain new, previously unknown elements that were only present in traces. So he reduced no less than 44 tonnes of mineral water to a few litres. And he actually discovered two blue lines in places where he had never seen anything before. This must be the signature of a new element, Bunsen concluded, and he named it caesium, after the Latin word for "sky blue"

– caesius. A little later he and his partner Gustav Kirchhoff found another element called rubidium, because its spectrum is dark red.

In just twenty years, twenty more elements were found with the help of the spectroscope – and eventually the noble gases in the last years of the nineteenth century.

## **Cosmic detective work**

Spectroscopy revolutionised astronomy. Just like the light from a street lamp, the light of the stars can also be analysed. The spectra can be used to find out what the stars are made of – and all that without ever having a sample of material in your hand!

## **Invisible spectra**

A spectrometer cannot only detect elements. If the spectra are extended beyond visible light, for example into the infrared range, the spectrometer is also ideal for analysing chemical compounds. Infrared spectroscopy is still one of the most important techniques of analytical chemistry in the field of organic compounds.