What is cesium used for

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Examples are tritium and cesium-137, both of which release beta particles that can ...

Caesium or Cesium is a soft, silvery-gold metal that reacts vigorously with water and air. It is used in atomic clocks, vacuum tubes, photoelectric cells, optical glasses, i...

The German chemist Robert Bunsen and physicist Gustav Kirchhoff discovered caesium in 1860 by the newly developed method of flame spectroscopy. The first small-scale applications for caesium were as a "getter" in vacuum tubes and in photoelectric cells. Caesium is widely used in highly accurate atomic clocks. In 1967, the International System of Units began using a specific hyperfine transition of neutral caesium-133 atoms to define the basic unit of time, the second.

Since the 1990s, the largest application of the element has been as caesium formate for drilling fluids, but it has a range of applications in the production of electricity, in electronics, and in chemistry. The radioactive isotope caesium-137 has a half-life of about 30 years and is used in medical applications, industrial gauges, and hydrology. Nonradioactive caesium compounds are only mildly toxic, but the pure metal"s tendency to react explosively with water means that caesium is considered a hazardous material, and the radioisotopes present a significant health and environmental hazard.

Caesium is the spelling recommended by the International Union of Pure and Applied Chemistry (IUPAC).[10] The American Chemical Society (ACS) has used the spelling cesium since 1921,[11][12] following Webster"s New International Dictionary. The element was named after the Latin word caesius, meaning "bluish grey".[13] In medieval and early modern writings caesius was spelled with the ligature ae as caesius; hence, an alternative but now old-fashioned orthography is caesium. More spelling explanation at ae/oe vs e.

Caesium exists in the form of different allotropes, one of them a dimer called dicaesium.[26]

Salts of Cs+ are usually colourless unless the anion itself is coloured. Many of the simple salts are hygroscopic, but less so than the corresponding salts of lighter alkali metals. The phosphate,[34] acetate, carbonate, halides, oxide, nitrate, and sulfate salts are water-soluble. Its double salts are often less soluble, and the low solubility of caesium aluminium sulfate is exploited in refining Cs from ores. The double salts with antimony (such as $CsSbCl_4$), bismuth, cadmium, copper, iron, and lead are also poorly soluble.[14]

Like all metal cations, Cs+ forms complexes with Lewis bases in solution. Because of its large size, Cs+ usually adopts coordination numbers greater than 6, the number typical for the smaller alkali metal cations. This difference is apparent in the 8-coordination of CsCl. This high coordination number and softness

(tendency to form covalent bonds) are properties exploited in separating Cs+ from other cations in the remediation of nuclear wastes, where 137Cs+ must be separated from large amounts of nonradioactive K+.[37]

Caesium fluoride (CsF) is a hygroscopic white solid that is widely used in organofluorine chemistry as a source of fluoride anions.[39] Caesium fluoride has the halite structure, which means that the Cs+ and F- pack in a cubic closest packed array as do Na+ and Cl- in sodium chloride.[28] Notably, caesium and fluorine have the lowest and highest electronegativities, respectively, among all the known elements.

The isotope 135Cs is one of the long-lived fission products of uranium produced in nuclear reactors.[56] However, this fission product yield is reduced in most reactors because the predecessor, 135Xe, is a potent neutron poison and frequently transmutes to stable 136Xe before it can decay to 135Cs.[57][58]

Almost all caesium produced from nuclear fission comes from the beta decay of originally more neutron-rich fission products, passing through various isotopes of iodine and xenon.[63] Because iodine and xenon are volatile and can diffuse through nuclear fuel or air, radioactive caesium is often created far from the original site of fission.[64] With nuclear weapons testing in the 1950s through the 1980s, 137Cs was released into the atmosphere and returned to the surface of the earth as a component of radioactive fallout. It is a ready marker of the movement of soil and sediment from those times.[14]

Caesium is a relatively rare element, estimated to average 3 parts per million in the Earth"s crust.[65] It is the 45th most abundant element and 36th among the metals.[66] Caesium is 30 times less abundant than rubidium, with which it is closely associated, chemically.[14]