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Is Cobalt Radioactive?

This short article aims to bring together the information on Cobalt and Radioactive Cobalt.

Is Cobalt Radioactive

Cobalt is a naturally occurring element found in rocks, soil, water, plants, and animals. When found in nature cobalt is not radioactive. There are 4 isotopes* of cobalt which are all radioactive and created by humans, in either a linear accelerator if it is to be used for commercial or medical purposes, or indirectly as a by-product of nuclear reactor operations, when structural materials such as steel are exposed to neutron radiation. The most common form of radioactive cobalt is $^{60}\text{Co}^\dagger$ which is used for commercial and medical purposes.

(<http://www.epa.gov/radiation/radionuclides/cobalt.htm>)

What is Radioactive Cobalt Used For?

^{60}Co is used in many common industrial applications, such as in levelling devices, thickness gauges, and in radiotherapy in hospitals. Large sources of ^{60}Co are increasingly used for sterilisation of spices and certain foods by a process that is sometimes called cold “pasteurisation”. The radiation that is emitted kills bacteria and other pathogens, without damaging the product or causing it to be radioactive after the irradiation process ceases.

^{60}Co is also used for industrial radiography where ^{60}Co radiation is used to detect structural flaws in metal parts in a non-destructive manner. Another of its uses is in a medical device for the precise treatment of otherwise inoperable deformities of blood vessels, cancer and brain tumours.

(<http://www.oncolink.upenn.edu/treatment/article.cfm?c=5&s=27&id=31>).

Radionuclides, such as ^{60}Co , that are used in industry or medical treatment are encased in shielded metal containers or housings, and are referred to as radiation ‘sources’. The shielding protects operators from exposure to the radiation.

(<http://www.epa.gov/radiation/radionuclides/cobalt.htm>).

Other isotopes such as ^{58}Co can be used for the “Schilling Test” which determines whether a patient’s body is absorbing Vitamin B12 normally.

* 2 or more atoms having the same atomic number but different mass numbers

† read as Cobalt sixty

Health Effects of Radioactive Cobalt

Exposure to ^{60}Co is unlikely unless you are undergoing certain medical treatments. Nevertheless, it is important to follow all of the relevant health and safety instructions associated with the use of radioactive cobalt, such as medical personnel standing behind protective screens when operating cobalt irradiation systems. This is because all ionising radiation, including that of ^{60}Co is known to increase the risk of cancer.

For a full review of available information on the health effects of radioactive cobalt, please refer to Chapter 3.3. of the ATSDR “Toxicological Profile for Cobalt” (<http://www.atsdr.cdc.gov/toxprofiles/tp33.pdf>) which independently reviews the data available up until 2004.

The Radioactive Isotopes of Elemental (Natural) Cobalt -59

| <i>Nuclide</i> | $^{56}\text{Co}^*$ | $^{57}\text{Co}^*$ | $^{58}\text{Co}^*$ | ^{59}Co | $^{60}\text{Co}^*$ |
|--------------------------|--------------------|--------------------|--------------------|------------------|--------------------|
| <i>Atomic Mass</i> | 55.940 | 56.936 | 57.936 | 58.933 | 59.934 |
| <i>Natural Abundance</i> | 0% | 0% | 0% | 100% | 0% |
| <i>Half Life</i> | 77 days | 270 days | 71.3 days | stable | 5.26 years |

Data taken from http://www.chemsoc.org/VISELEMENTS/pages/data/cobalt_data.html

*Radioactive

References and Further Reading

<http://www.atsdr.cdc.gov/toxprofiles/tp33-c1.pdf> - public health statement

<http://www.atsdr.cdc.gov/toxprofiles/tp33.pdf> - full report

<http://www.atsdr.cdc.gov/interactionprofiles/ip07.html>

http://www.chemsoc.org/VISELEMENTS/pages/data/cobalt_data.html

<http://www.epa.gov/radiation/radionuclides/cobalt.htm>

<http://www.nlm.nih.gov/medlineplus/ency/article/003572.htm>

<http://www.oncolink.upenn.edu/treatment/article.cfm?c=5&s=27&id=31>