

Free research paper on carbon

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Carbon (C) is a chemical element of atomic number 6 and belongs to group 14 on the periodic table. Carbon is a nonmetallic element and it's the sixth in abundance in the universe. Coal is the most readily available source of carbon. Carbon in its raw form is of little value and has to be processed into commercially applicable forms. Commercial carbon appears in three allotropes: graphite, amorphous, and diamond. This is a research paper on carbon, its applications and negatives effects on the environment (Jefferson Lab).

CARBON ALLOTROPES

Amorphous carbon is the resulting black material when a carbonaceous fuel or compound is burnt in the absence of enough oxygen. The material, also referred to as soot, gas black, channel black, or carbon black is used in several industrial applications. Soot is used to make paints, inks and rubber products due to its black color. The material is also pressed into cylindrical forms for the manufacture of dry cells among other applications (TutorVista).

Graphite carbon is a solid substance which is characteristically soft. Graphite

is gotten from burning petroleum coke in an oxygen free oven. Petroleum coke is the residue that results from crude oil refinement. A small portion of graphite occurs naturally, but it cannot be commercially exploited. Natural graphite is of two types, alpha and beta. They both possess the same physical properties, but differ in their crystal structures. Commercially prepared graphite is of the alpha type. Graphite is mainly used as a lubricant. Other applications of the graphite include the manufacture of steel, whereby it is used as coke. Coke is prepared by heating coal without oxygen. Graphite is also used in pencils (Jefferson Lab).

Diamond is a naturally occurring allotrope of carbon and is best known for its hardness. Natural diamond is used for jewelry manufacture. Commercially applied diamond used in the making of cutting tools is artificially prepared. Artificial diamond is made by squeezing graphite under high temperature and pressure for a duration of several weeks until the crystal structure is altered. Diamond and graphite differ only in crystal structure.

White carbon is an allotrope of carbon that was discovered in 1969. It has a peculiar property that enables it to split a beam of light into two. This form of carbon has no conceivable commercial applications yet (Jefferson Lab).

CARBON 14 ISOTOPE

Carbon-14 is a radioactive carbon isotope which has a half-life of 5,730 years. The isotope decays into nitrogen-14 through beta decay. This element is used in a process called carbon dating which entails determining the age of formerly living things. Carbon dating is done by estimating the reduction of carbon-14 in a body and comparing it with the isotope's half life (Jefferson Lab).

THE CARBON CYCLE

Carbon is present as carbon dioxide in the atmosphere. Carbon atoms easily form covalent bonds with other atoms due to the positioning of its electrons. This makes carbon atoms the main building units of organic matter. Carbon cycle can be referred to as a perfect cycle because carbon is replenished in the atmosphere once it is removed (TutorVista).

Sources of carbon

- The major source of carbon is carbon dioxide. The atmosphere and the ocean waters contain 700×10^9 and $35,000 \times 10^9$ metric tones of carbon dioxide respectively.
- Carbonates from rocks will decompose chemically to give carbon dioxide.
- Fossil fuels such as coal, peat, and petroleum.
- Limestone and marble from the oceans.

Figure 1: Diagram of the carbon cycle, Source: TutorVista

Carbon dioxide uptake

Carbon dioxide is removed from the atmosphere and fixed into living matter through photosynthesis in plants. Carbon dioxide is then converted into organic compounds and oxygen is given out. An estimated 7×10^{13} kg of carbon dioxide is fixed by photosynthesis annually.

Carbon then flows through the food chain as it is passed from herbivores, carnivores, and decomposers.

Release of carbon dioxide

Carbon leaves the living world in the form of carbon dioxide in a number of ways:

- Carbon dioxide is respired out by living organisms.

- Released in the breakdown of organic matter through the action of bacteria or fungi.
- Burning of fossil and biomass fuels.

POLLUTION/GREENHOUSE EFFECTS OF CARBON

Human activities disrupt the natural carbon cycle through the release of excess carbon dioxide than can be fixed through photosynthesis. Carbon dioxide is produced through industrial activities that involve burning of fossil fuels, which pump the gas into the atmosphere. Carbon dioxide is a greenhouse gas. Greenhouse gases form a blanket that traps infrared radiation, which has a large wavelength preventing dissipation of the heat above the layer. Greenhouse effect causes melting of polar ice and rise in sea levels.

Carbon is a very essential element. There are an estimated ten million carbon compounds. A whole area of study called organic chemistry is dedicated to the study of carbon compounds. Carbon compounds are essential for life as carbon is the basic unit of organic matter.

Works Cited

Jefferson Lab. The Element Carbon. n. p. 2014. Web. 10 Dec 2014.

TutorVista. com. The Carbon Cycle. NCS Pearson. 2014. 10 Dec 2014.