Any people believe that diamonds are formed from the metamorphism of coal. That idea continues to be the "how diamonds form" story in many science classrooms.

It's easy to see where the idea came from, though. Diamonds and coal are both, at their base, different forms of the element carbon (C on the periodic table). And yes, pressure is a key part of what turns decaying carbon-based life forms such as plants into coal, as well as what turns carbon into diamonds. But the reality is just a little bit more complex than Superman's super-strength.

First of all, let's look at the chemical compositions of these two forms of carbon. **Diamonds** are essentially pure carbon formed into a crystalline structure. The rarer, colored diamonds do contain minor impurities (boron, for example, makes diamonds blue, while nitrogen turns them yellow), but those impurities exist on a scale of just one atom in a million.

**Coal** has rarely played a role in the formation of diamonds. In fact, most diamonds that have been dated are much older than Earth's first land plants - the source material of coal! That alone should be enough evidence to shut down the idea that Earth's diamond deposits were formed from coal.

Another problem with the idea is that coal seams are sedimentary rocks that usually occur as horizontal or nearly horizontal rock units. However, the source rocks of diamonds are vertical pipes filled with igneous rocks.
Beyond that, carbon requires a lot more than pressure to become a diamond. It also requires enormous amounts of heat. In fact, diamonds require a combination of heat (thousands of degrees) and pressure (130,000 atmospheres) that can typically only be found about 90 to 100 miles below the surface of the Earth, deep within the mantle. This heat and pressure work together to allow the carbon to form into the crystalline lattice structure that we know so well. When presented with this heat and pressure, each carbon atom bonds with four other atoms in what is known as a tetrahedral unit. This strong molecular bond provides diamonds with not just their structure but also their classic hardness. That bond would not be possible if impurities were present on anything but a superficial level.

Geologists believe that the diamonds in all of Earth's commercial diamond deposits were formed in the mantle and delivered to the surface by deep-source volcanic eruptions. These eruptions produce the kimberlite and lamproite pipes that are sought after by diamond prospectors. Diamonds weathered and eroded from these eruptive deposits are now contained in the sedimentary (placer) deposits of streams and coastlines.

The formation of natural diamonds requires very high temperatures and pressures. These conditions occur in limited zones of Earth's mantle about 90 miles (150 kilometers) below the surface where temperatures are at least 2000 degrees Fahrenheit (1050 degrees Celsius). This critical temperature-pressure environment for diamond formation and stability is not present globally. Instead it is thought to be present primarily in the mantle beneath the stable interiors of continental plates.

Diamonds formed and stored in these "diamond stability zones" are delivered to Earth's surface during deep-source volcanic eruptions. These eruptions tear out pieces of the mantle and carry them rapidly to the surface. See Location 1 in the diagram at the top of the page. This type of volcanic eruption is extremely rare and has not occurred since scientists have been able to recognize them.

Is coal involved? Coal is a sedimentary rock, formed from plant debris deposited at Earth's surface. It is rarely buried to depths greater than two miles (3.2 kilometers). It is very unlikely that coal has been moved from the crust down to a depth well below the base of a continental plate. The carbon source for these mantle diamonds is most likely carbon trapped in Earth's interior at the time of the planet's formation.

Tiny diamonds have been found in rocks that are thought to have been subducted deep into the mantle by plate tectonic processes - then returned to the surface. Diamond formation in a subducting plate might occur as little as 50 miles (80 kilometers) below the surface and at temperatures as low as 390 degrees Fahrenheit (200 degrees Centigrade). In another study, diamonds from Brazil were found to contain tiny mineral inclusions consistent with the mineralogy of oceanic crust. Others have inclusions that suggest that subducted seawater was involved in their formation.
**Is coal involved?** Coal is a possible carbon source for this diamond-forming process. However, oceanic plates are more likely candidates for subduction than continental plates because of their higher density. The most likely carbon sources from the subduction of an oceanic plate are carbonate rocks such as limestone, marble, and dolomite, and possibly particles of plant debris in offshore sediments.

**Throughout its history,** Earth has been repeatedly hit by large asteroids. When these asteroids strike the earth, extreme temperatures and pressures are produced. For example: when a six mile (10 kilometer) wide asteroid strikes the earth, it can be traveling at up to 9 to 12 miles per second (15 to 20 kilometers per second). Upon impact this hypervelocity object would produce an energy burst equivalent to millions of nuclear weapons and temperatures hotter than the sun's surface.

The high temperature and pressure conditions of such an impact are more than adequate to form diamonds. This theory of diamond formation has been supported by the discovery of tiny diamonds around several asteroid impact sites.

The most convincing evidence that coal **did not** play a role in the formation of most diamonds is a comparison between the age of Earth's diamonds and the age of the earliest land plants.

Almost every diamond that has been dated formed during the **Precambrian Eon** - the span of time between Earth's formation (about 4,600 million years ago) and the start of the Cambrian Period (about 542 million years ago). In contrast, the earliest land plants did not appear on Earth until about 450 million years ago - nearly 100 million years after the formation of virtually all of Earth's natural diamonds.

**Since coal is formed from terrestrial plant debris,** and the oldest land plants are younger than almost every diamond that has ever been dated, it is easy to conclude that coal did not play a significant role in the formation of Earth's diamonds.

**References**


Read more at http://www.geologyin.com/2017/01/do-diamonds-really-come-from-coal.html#ZQlkbQlaBLweiBw1.99